DIGITAL PROJECTION

USER MANUAL

INSTALLATION AND QUICK-START GUIDE
CONNECTION GUIDE
OPERATING GUIDE
REFERENCE GUIDE

HIGHlite 660 Series

High Brightness Digital Video Projector

Rev G July 2014

112-668G

About This Document

Please follow the instructions in this manual carefully to ensure safe and long-lasting use of the projector.

Keep this manual handy for future reference.

Symbols used in this manual

Many pages in this document have a dedicated area for notes. The information in that area is accompanied by the following symbols:

WARNING: this symbol indicates that there is a danger of physical injury to yourself and/or damage to the equipment unless the instructions are closely followed.

ELECTRICAL WARNING: this symbol indicates that there is a danger of electrical shock unless the instructions are closely followed.

NOTE: this symbol indicates that there is some important information that you should read.

Product revision

Because we at Digital Projection continually strive to improve our products, we may change specifications and designs, and add new features without prior notice.

Legal notice

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Notes

Introduction

Congratulations on your purchase of this Digital Projection product.

Your projector has the following key features:

- Full range of digital and legacy analog inputs
- Control of most aspects of the projector's operation via LAN and RS232
- Support for a number of aspect ratios and screen sizes
- Non-linear warp adjustment by moving points on an interpolated grid
- Ceiling mount and rear-screen installation options
- Simultaneous display of two sources via Picture-In-Picture
- Long lamp life
- Motorised lens mount

A serial number is located on the back of the projector. Please record it here:

Notes

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INSTALLATION AND QUICK-START GUIDE

HIGHlite 660 Series

High Brightness Digital Video Projector

Rev G July 2014

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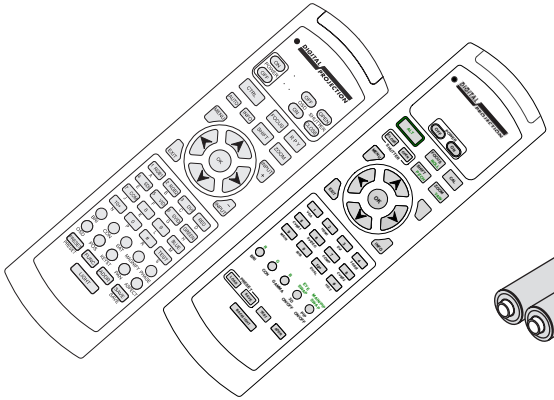
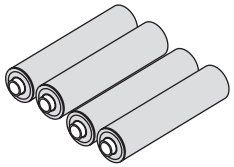
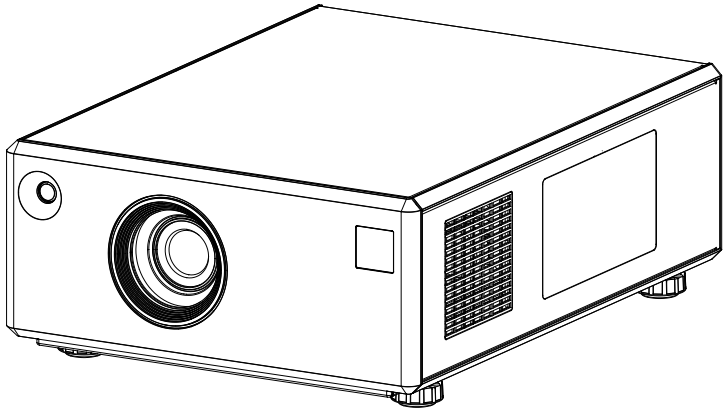
What's In The Box?



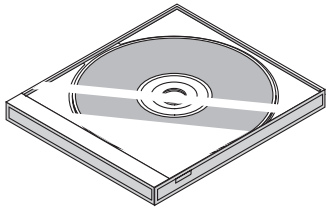
Remote control (105-023) Rev A or B



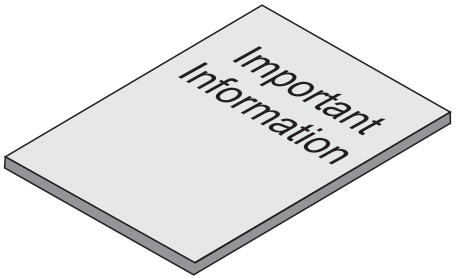
4x AAA batteries



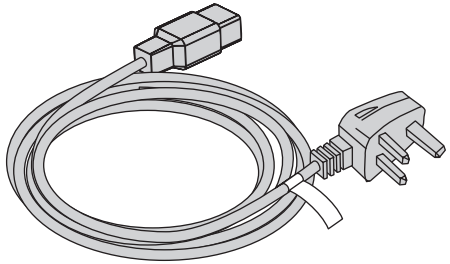
Projector



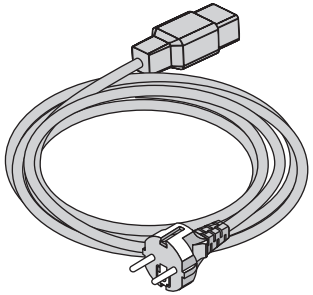
User Manual on disc (115-759)



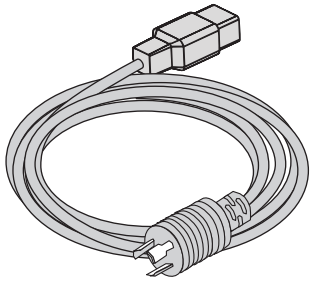
Important Information (111-971)



Power cable, United Kingdom (102-180)



Power cable, Europe (102-163)



Power cable, North America (102-165)

Notes

Make sure your box contains everything listed. If any pieces are missing, contact your dealer.

Only one remote will be supplied with the projector. For more information, see ***Remote Control*** *further in this guide.*

You should save the original box and packing materials, in case you ever need to ship your projector.

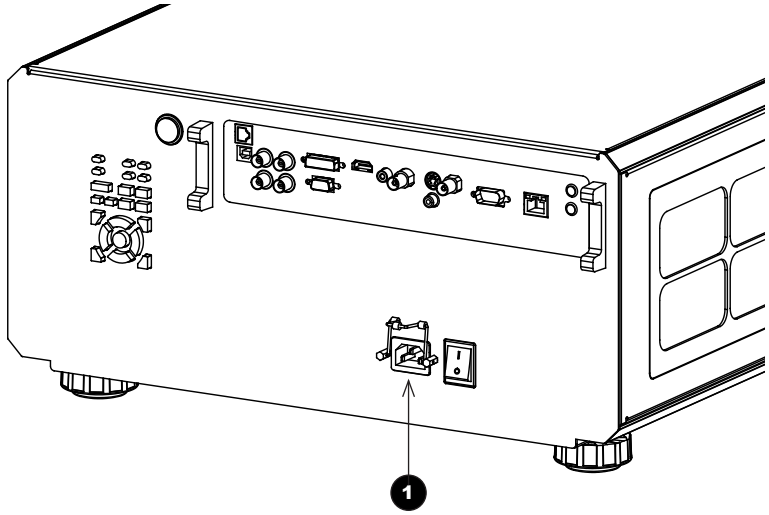
The projector is shipped without a lens.

Only one power cable - dependent on the destination territory - will be supplied with the projector.

Connecting The Power Supply

Lift the cable lock up, push the mains connector in firmly and push the lock down to secure the cable.

1 **AC mains inlet with cable lock**



Rear view of the projector

Notes

Use only the power cable provided.

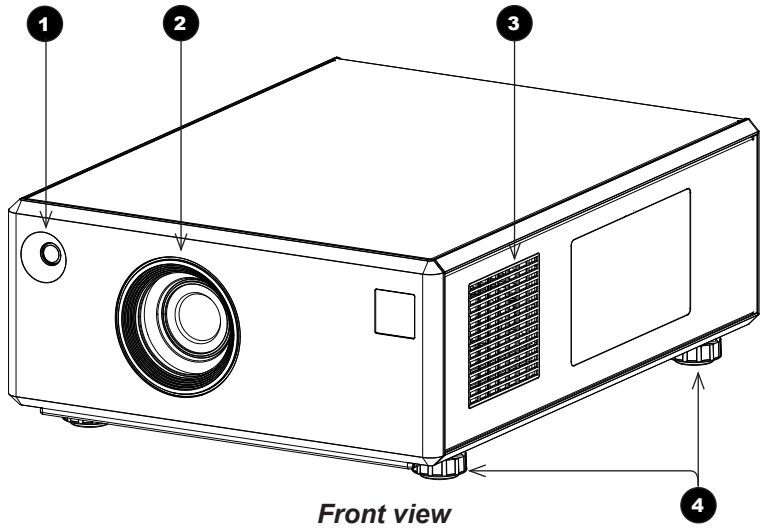
Ensure that the power outlet includes a ground connection as this equipment MUST be earthed.

Handle the power cable carefully and avoid sharp bends. Do not use a damaged power cable.

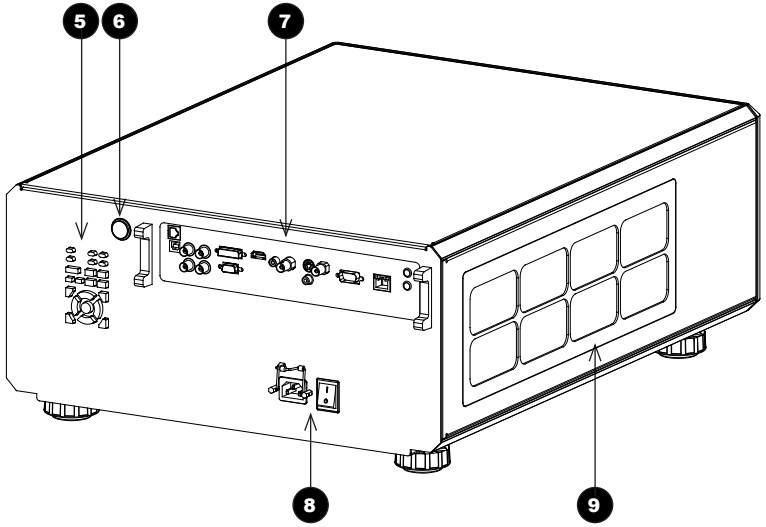
Projector Overview

Front and rear views

1. Front infrared window
2. Lens
3. Air outlet
4. Adjustable feet
5. Control panel
6. Rear infrared window
7. Connection panel
8. Power switch and power connection
9. Air inlet



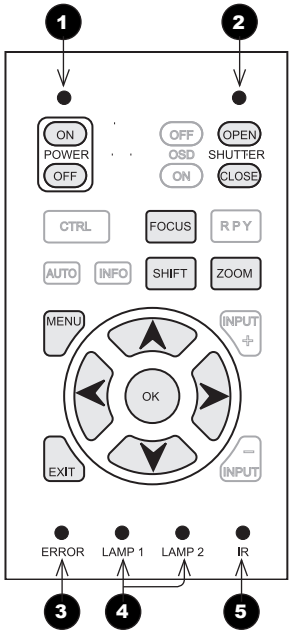
Front view



Rear view

Notes

Control panel indicators



1 Power indicator

Behavior		Meaning
Off		The projector is switched off.
On (amber)		The projector is in Standby mode.
On (green)		The projector is switched on (Normal mode).

2 Shutter indicator

Behavior		Meaning
On (amber)		The shutter is closed.
On (green)		The shutter is open.

3 Error indicator

Behavior		Meaning
On (red)		Voltage Error
Flashing		Temperature Error

4 Lamp 1 and Lamp 2 indicators

Behavior		Meaning
On (green)		The lamp is switched on (100%).
On (amber)		The lamp is switched on (85-99%).
Flashing (green)		The lamp is warming up.
Flashing (amber)		The lamp is cooling down.
Flashing (red)		Lamp Error

5 Infrared indicator

Behavior		Meaning
Flashing (blue)		The projector is receiving input from the remote control.

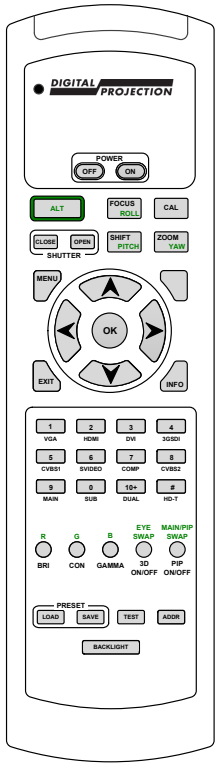
Notes

During startup all LEDs light up at the same time to indicate the projector is carrying out a self-test.

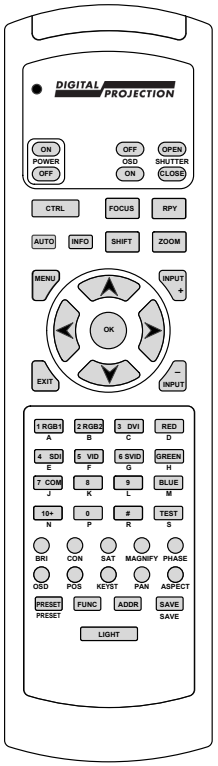
Remote Control

The projector is equipped with one of the remote control devices shown here. The device on the left (105-023 Rev B) was introduced in June 2013; a projector purchased before that date is equipped with the device on the right, 105-023 Rev A.

Both devices and their functions are described in the following pages.



Remote (105-023) Rev B

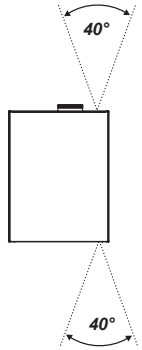


Remote (105-023) Rev A

Infrared reception

The projector has infrared sensors at the front and back.

The angle of acceptance is 40°. Make sure that the remote control is within the angle of acceptance when trying to control the projector.



Infrared reception

Notes

Infrared reception is confirmed by the blue IR LED flashing on the control panel.

The infrared receivers are disabled when a remote control is connected via a cable. For more information, see ***Control Connections*** *in the* ***Connection Guide****.*

Remote control 105-023 Rev B

1 **Transmit indicator**
Flashes when the remote control sends a signal to the projector.
Lights solidly when the projector is in LENS ADJUSTMENT mode.

2 **Power ON / OFF**

3 **ALT**
Press and hold this button, then press a green-labeled button.

4 **Shutter OPEN / CLOSE**

5 **MENU**
Access the projector OSD (on-screen display).

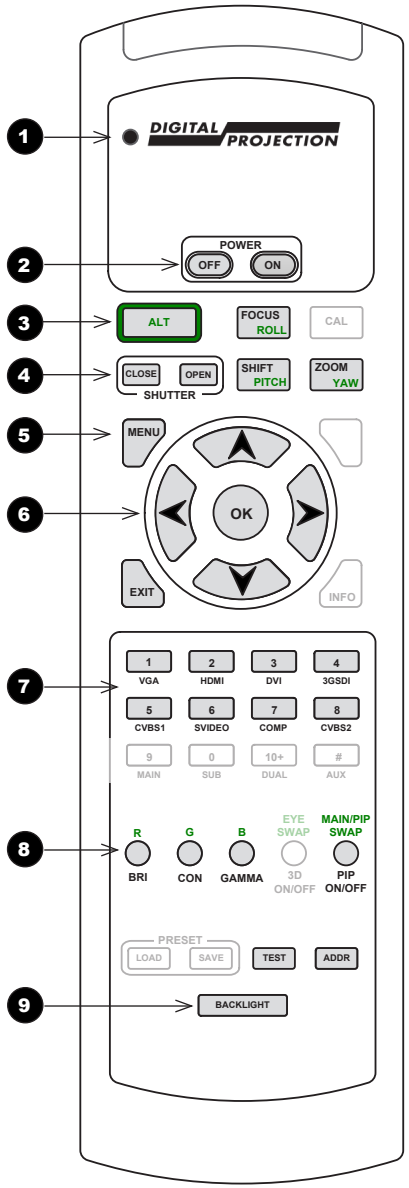
6 **Navigation**
Navigate through the menus with the arrows, confirm your choice with **OK**.

7 **Input selection**
Select input source.

8 **Image adjustment**
Adjust brightness, contrast and gamma.
Press this button while holding the **ALT** button down to switch red, green and blue channels on and off.

9 **Remote control backlight ON / OFF**
Make the remote control buttons glow in the dark, or switch this feature off.

continues on next page...



Remote control 105-023 Rev B

Notes

Only the controls shown highlighted are used on this projector.

For more information about LENS ADJUSTMENT mode, see ***Adjusting the lens*** *further in this guide.*

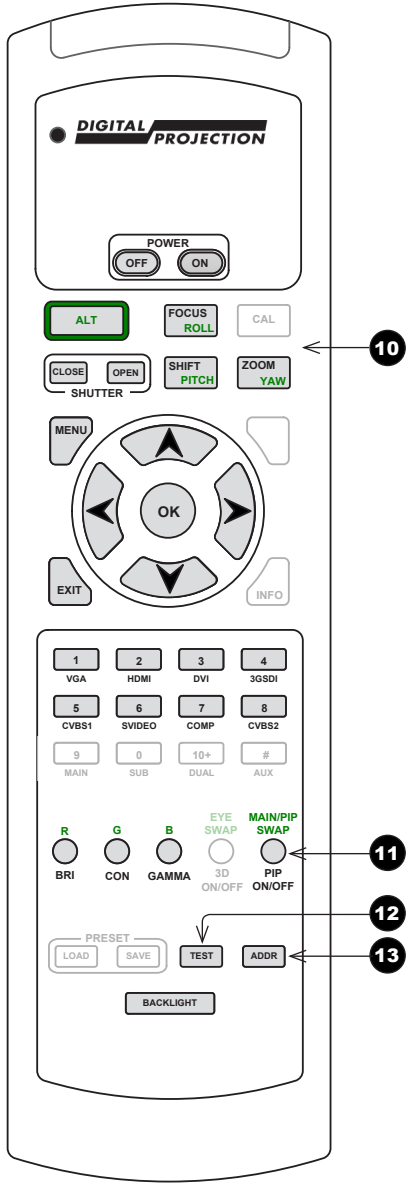
Remote control 105-023 Rev B - continued from previous page

10 **Lens controls**
Adjust position, zoom and focus.

11 **PIP ON/OFF**
When in PIP mode, display or hide the PIP image.

12 **Test**
Switch to test pattern.

13 **IR address**
Set up an address to match the IR address of a projector.



Remote control 105-023 Rev B

Notes

Only the controls shown highlighted are used on this projector.

For more information about IR addresses, see ***Setting up an IR address*** *in the* ***Operating Guide****.*

Remote control 105-023 Rev A

1 **Transmit indicator**
Flashes when the remote control sends a signal to the projector.
Lights solidly when the projector is in LENS ADJUSTMENT mode.

2 **Power ON / OFF**

3 **MENU**
Access the projector OSD (on-screen display).

4 **Navigation**
Navigate through the menus with the arrows, confirm your choice with **OK**.

5 **Input selection**
Select input source.

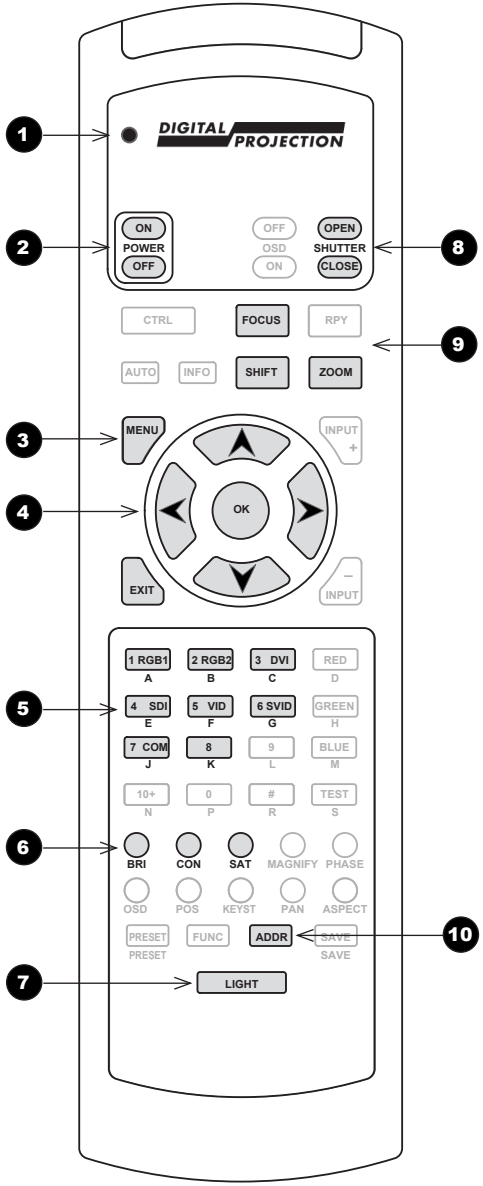
6 **Image adjustment**
Adjust brightness, contrast and saturation.

7 **Remote control backlight ON / OFF**
Make the remote control buttons glow in the dark, or switch this feature off.

8 **Shutter OPEN / CLOSE**

9 **Lens controls**
Adjust position, zoom and focus.

10 **IR address**
Set up an address to match the IR address of a projector.



Remote control 105-023 Rev A

Notes

Only the controls shown highlighted are used on this projector.

For more information about LENS ADJUSTMENT mode, see ***Adjusting the lens*** *further in this guide.*

For more information about IR addresses, see ***Setting up an IR address*** *in the* ***Operating Guide****.*

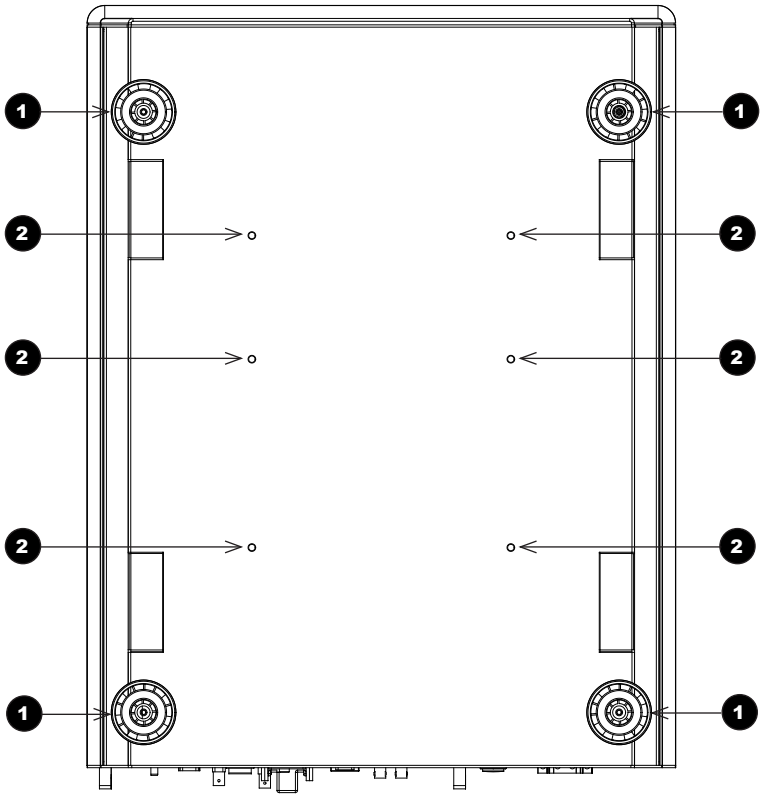
Positioning The Screen And Projector

1. Install the screen, ensuring that it is in the best position for viewing by your audience.
2. Mount the projector, ensuring that it is at a suitable distance from the screen for the image to fill the screen. Set the adjustable feet so that the projector is level, and perpendicular to the screen.

The dimension drawing below shows the positions of the feet for table mounting, and the fixing holes for ceiling mounting.

1 **Four adjustable feet**

2 **Six M6 holes for ceiling mount**
The screws should not penetrate more than 15 mm (0.6 in.) into the body of the projector.



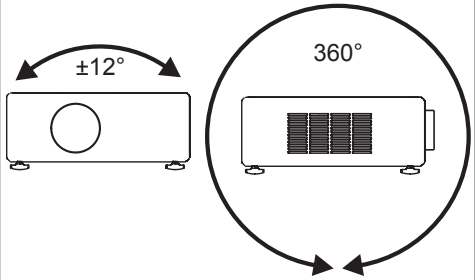
Notes

Always allow the projector to cool for five minutes before disconnecting the power or moving the projector.

Ensure that there is at least 30 cm (12 in.) of space between the ventilation outlets and any wall, and 10 cm (4 in.) on all other sides.

Do not stack more than three projectors.

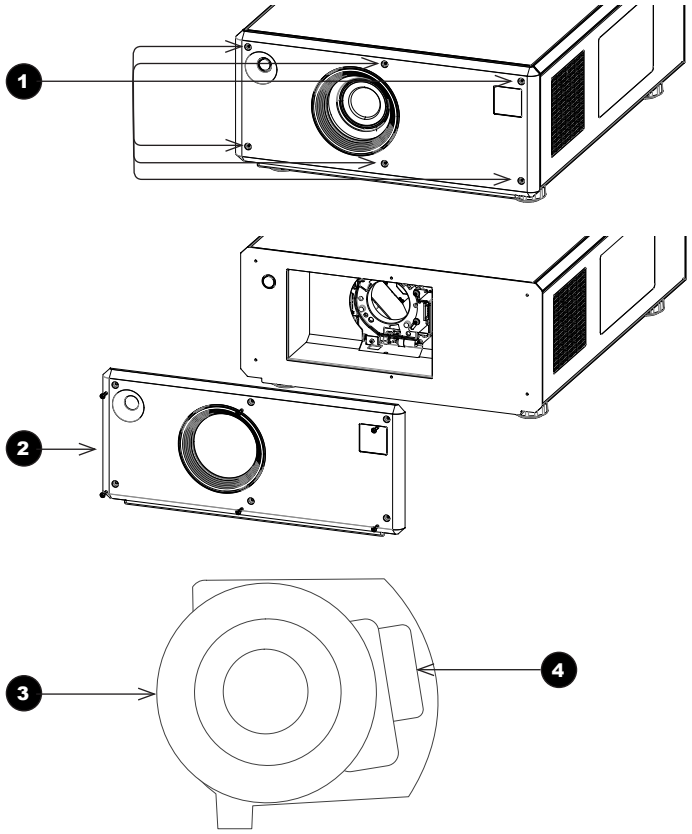
Do not tilt the projector more than ±12° from side to side when in use, as this may cause serious lamp failure, damage the lamp module and cause extra cost on replacement.



Changing The Lens

Inserting a new lens

1. Remove the six ***screws*** (1) securing the front cover to the body of the projector.
2. Remove the ***front cover*** (2) from the projector.
3. Remove the lens from its packaging and remove the two protective caps from the front and back of the lens.
4. Insert the ***lens*** (3) into the lens aperture, making sure that the plug on the zoom drive mechanism lines up with the ***socket*** (4) on the right of the lens aperture.
5. Push the lens in firmly as far as it will go.
6. Rotate the lens clockwise as far as it will go.
7. Replace the front cover and secure it with the six screws.



Notes

Before changing the lens, always make sure the projector is switched off and fully disconnected from its power supply.

Always allow the lamp to cool for five minutes before:

- disconnecting the power
- moving the projector

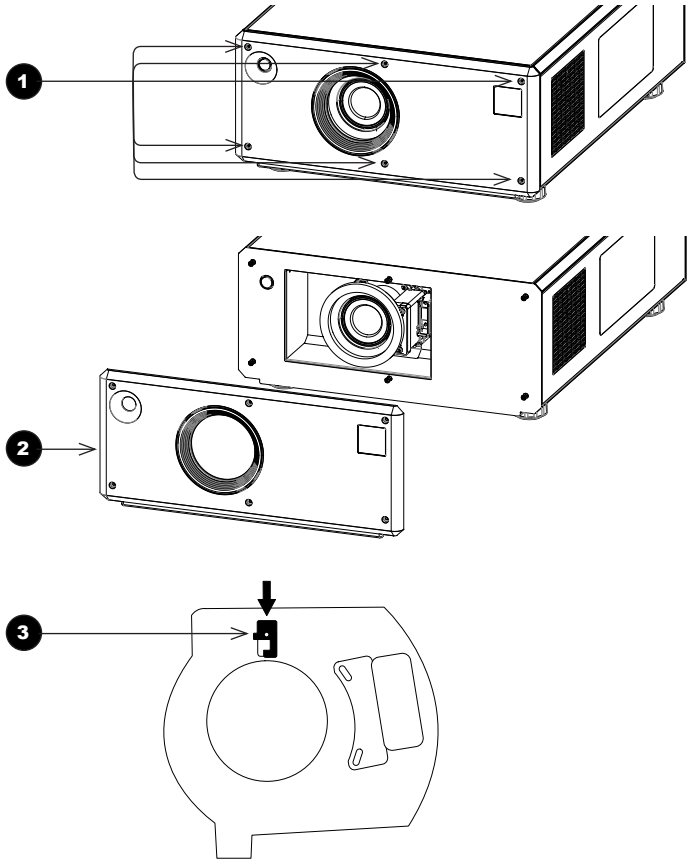
When changing the lens, avoid using excessive force as this may damage the equipment.

Avoid touching the surface of the lens as this may result in image impairment.

Take care to preserve the original lens packaging and protective caps for future use.

Removing the lens

1. Remove the six ***screws*** (1) securing the front cover to the body of the projector.
2. Remove the ***front cover*** (2) from the projector.
3. Push down the ***lens holder tab*** (3).
4. Rotate the lens anti-clockwise
5. Pull the lens forward to remove it from the lens aperture.



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Always allow the lamp to cool for five minutes before:

- disconnecting the power
- moving the projector

When changing the lens, avoid using excessive force as this may damage the equipment.

Avoid touching the surface of the lens as this may result in image impairment.

Take care to preserve the original lens packaging and protective caps for future use.

Operating The Projector

Switching the projector on

1. Connect the power cable between the mains supply and the projector. Switch on at the switch next to the power connector.
2. Wait until the self-test has completed and the standby indicator on the projector control panel shows amber. The lamp will be off and the projector will be in STANDBY mode.
3. Press **ON** on the remote control or the control panel and hold for three seconds, to switch the projector ON. The power indicator on the control panel will show green, the lamp will light and the shutter will open.

Switching the projector off

1. Press **OFF** on the remote control or the control panel, and hold for three seconds. The power indicator on the control panel will show amber, the lamp will go out and the cooling fans will run for a short time until the projector enters STANDBY mode.
2. If you need to switch the projector off completely, switch off at the mains power switch next to the power connector and then disconnect the power cable from the projector

Notes

The self-test is running when all the LEDs on the control panel are lit.

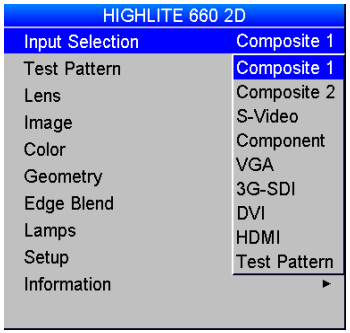
Always allow the lamp to cool for five minutes before:

- disconnecting the power
- moving the projector

Selecting an input signal or test pattern

Input signal

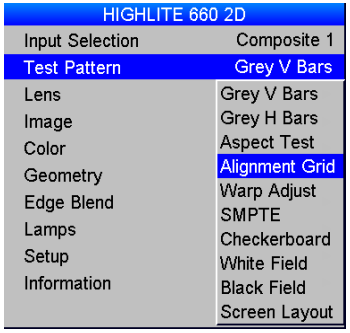
1. Connect an image source to the projector.
2. Switch to the input you want to display:
   - Press one of the input buttons on the remote control, or
   - Open the On-screen display (OSD) by pressing **MENU**. Select an input signal from the **Input Selection** menu, using the **UP** and **DOWN** arrow buttons, then press **OK**.



Test pattern

To display a test pattern:

1. Open the OSD by pressing **MENU**.
2. Select **Test Pattern** from the **Input Selection** menu, using the **UP** and **DOWN** arrow buttons, then press **OK**.
3. Select a pattern from the **Test Pattern** menu, using the **UP** and **DOWN** arrow buttons, then press **OK**.
4. Close the OSD by pressing **MENU** again.



Notes

*For full details of how to use the controls and the menu system, see the **Operating Guide**.*

If the projector is switched off while in TEST PATTERN mode, it will still be in TEST PATTERN mode when switched on again.

Adjusting the lens

The lens can be adjusted using the **Lens** menu, or:

Zoom

- Press **ZOOM**, then use the **UP** and **DOWN** arrow buttons on the keypad or remote control to adjust the size of the image on the screen. When the adjustment is finished, press **EXIT**.

Focus

- Press **FOCUS**, then use the **UP** and **DOWN** arrow buttons on the keypad or remote control to adjust the focus. When the adjustment is finished, press **EXIT**.

Shift

- Press **SHIFT**, then use the **UP**, **DOWN**, **LEFT** and **RIGHT** arrow buttons on the keypad or remote control to adjust the position of the image on the screen. When the adjustment is finished, press **EXIT**.

Notes

When any of the three lens adjustment buttons is pressed, the blue Transmit indicator on the remote control will light for 10 seconds:

After 10 seconds, if no adjustment has been made, the indicator will go out and the lens adjustment button must be pressed again to resume adjustment.

To end the adjustment before 10 seconds has elapsed, press the **EXIT** *button.*

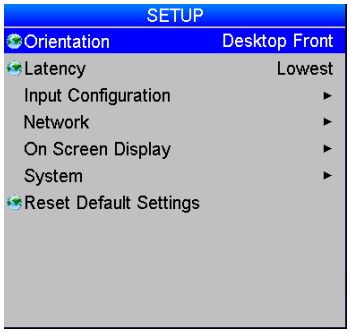
All other adjustments will be locked out until the lens adjustment is ended.

Adjusting the image

Orientation

- This can be set from the **Setup** menu.

  Select the orientation which suits the positioning of the projector.

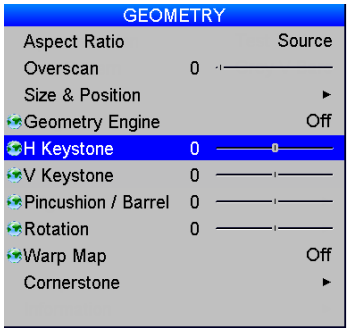


Main Menu
Setup

Lens shift works from the audience's perspective, regarless of projector orientation. For example, ***SHIFT UP*** *moves the image toward the ceiling in both Desktop and Ceiling mode.*

Keystone

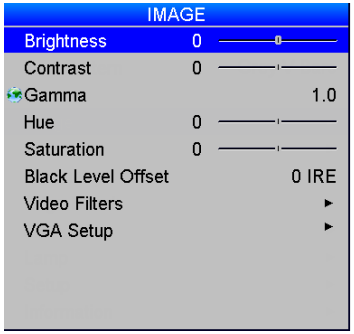
- This can be set from the **Geometry** menu.



Main Menu
Geometry

Picture

- Settings such as **Brightness** and **Contrast** can be set from the **Image** menu.
- You can also set **Brightness**, **Contrast** or **Gamma** by pressing **BRI**, **CON** or **GAMMA** on the remote control.



Main Menu
Image

For full details of how to use the controls and the menu system, see the ***Operating Guide****.*

Notes

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DIGITAL PROJECTION

CONNECTION GUIDE

HIGHlite 660 Series

High Brightness Digital Video Projector

Rev G July 2014

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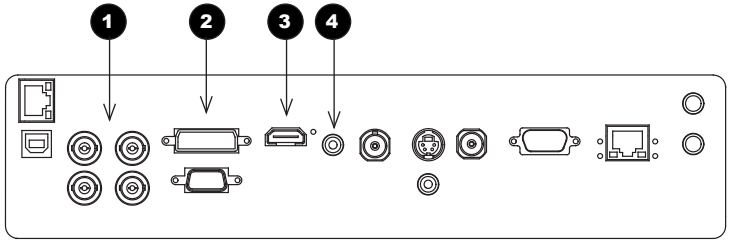
Control Connections 23

Signal Inputs And Outputs



1 **Component**

When using ***RGsB or RGBS:***

- Set **Component Colour Space** in the **Setup/Input Configuration** menu to **RGB**.
- Set **Component Sync Type** in the **Setup/Input Configuration** menu to **Auto**, except when the projector has problems selecting between **3 Wire (RGsB)** and **4 Wire (RGBS)**.

When using YPbPr:

- Set **Component Colour Space** in the **Setup/Input Configuration** menu to **YPbPr**.

2 **DVI**

This input can receive both analog and digital signal. Set **DVI-I Port** in the **Setup/Input Configuration** menu to choose between **Analog** and **Digital**.

3 **HDMI**

4 **S/PDIF**

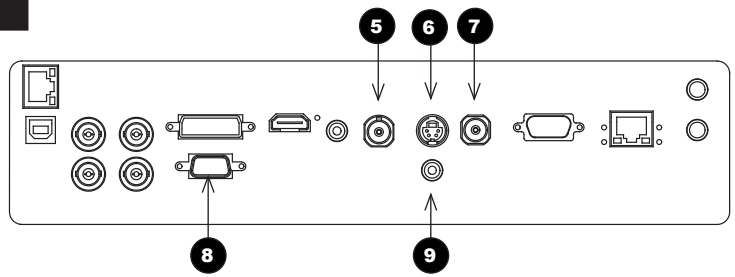
Compatible audio sample packets on the ***HDMI*** input stream are decoded and output on the ***SPDIF*** connector. This is a digital output.

Notes

*For a complete listing of pin configurations for all signal and control connectors, see **Wiring Details** in the **Reference Guide**.*

*For further information on setting up the DVI input, see **Input Configuration** in the **Operating Guide**.*

Signal Inputs And Outputs (continued)



5 **Composite 1 (CVBS 1)**

Connect a ***Composite Video*** input signal to the BNC connector.

6 **S-Video**

Connect to the 4-pin mini-DIN connector.

7 **3G-SDI**

If two video streams are being transmitted, set **3G Level B Stream** in the **Setup/Input Configuration** menu to choose one of them.

8 **VGA**

Use **Auto Setup** in the **Image/VGA Setup** menu.

9 **Composite 2 (CVBS 2)**

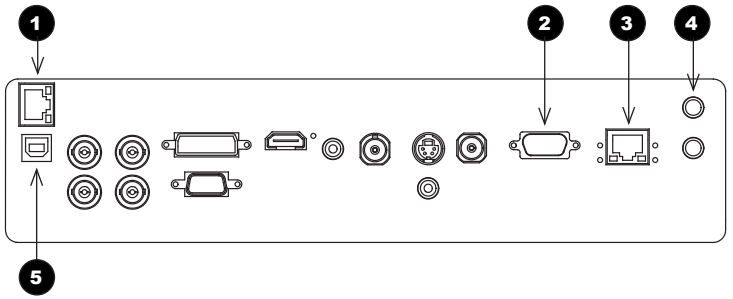
Connect a ***Composite Video*** input signal to the RCA phono connector ***CVBS2***.

Notes

*For a complete listing of pin configurations for all signal and control connectors, see **Wiring Details** in the **Reference Guide**.*

*For more VGA settings, see **Image menu** in the **Operating Guide.***

Control Connections



1 **Update port**
All of the projector's features can be controlled via a serial connection, using the commands described in the ***Protocol Guide.***
In addition, the Update port is used to download, via LAN, firmware updates issued from time to time by Digital Projection.
Use a crossed LAN cable to connect directly to a computer, or an uncrossed cable to connect to a network hub.

2 **RS232**
All of the projector's features can be controlled via a serial connection, using commands described in the ***Protocol Guide***.
Use a null-modem cable to connect directly to a computer, or a straight cable to connect to a modem.

3 **LAN**
The projector Warp function is controlled through this port. In addition, this port can be used with the ***Virtual OSD*** to control the projector.
Use a crossed LAN cable to connect directly to a computer, or an uncrossed cable to connect to a network hub.

4 **Wired remote output**
To synchronise the control of multiple projectors, connect the wired remote output of one projector to the wired remote input of another.

Wired remote input
If infrared signals from the remote control cannot reach the projector due to excessive distance or obstructions such as walls or cabinet doors, you can connect an external IR repeater to the remote control input, and position its IR sensor within range of the operator.

5 **Service port**
The Service port is used to download, via USB, firmware updates issued from time to time by Digital Projection.

Notes

*For a complete listing of pin configurations for all signal and control connectors, see **Wiring Details** in the **Reference Guide**.*

*For a list of all commands used to control the projector via an RS232 or LAN connection, see the **Protocol Guide**.*

*For details on using the Virtual OSD, see the **Protocol Guide**.*

*For further information about LAN connectivity, see **Control Connections** in the **Reference Guide**.*

Only one remote connection (RS232 or LAN) should be used at any one time.

Plugging in the remote control cable will disable the infrared receivers.

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DIGITAL PROJECTION

OPERATING GUIDE

HIGHlite 660 Series

High Brightness Digital Video Projector

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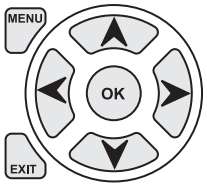
Using The Menus

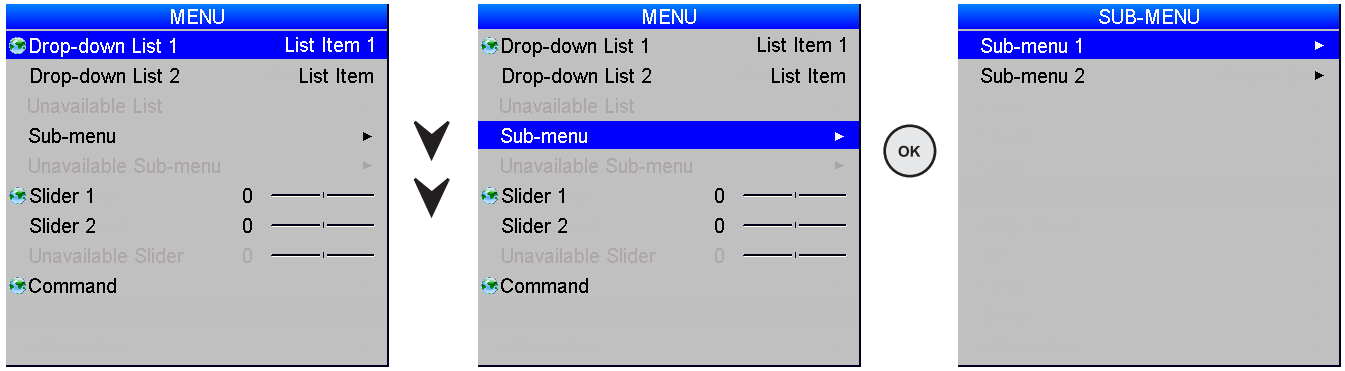
Use the buttons on the projector control panel or on the remote control, to access the menu system.



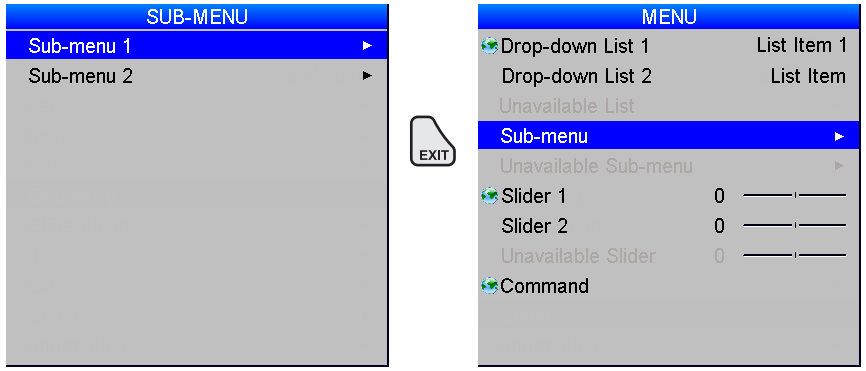
- To open or close the on-screen display (OSD), press **MENU**.

Menus and sub-menus

- To open a sub-menu, select it using the **UP** and **DOWN** arrow buttons, then press **OK**.



- To return to the previous menu, press **EXIT**.



Notes

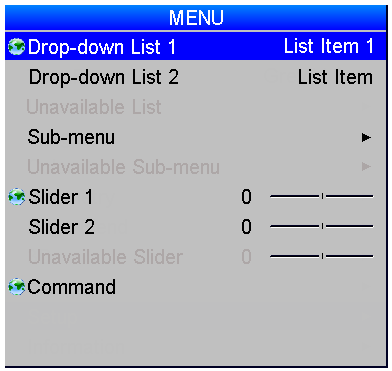
Some menu items may not be available due to settings in other menus. These will be grayed out on the actual menu.

*When **a globe icon** appears next to a setting, the setting affects all sources and all inputs; otherwise, only the current input source will be affected if you change the setting.*

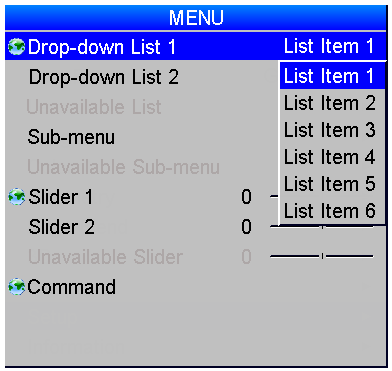
Drop-down lists

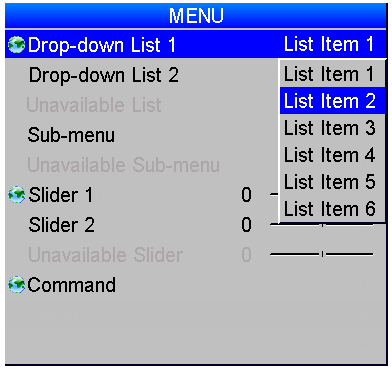
To use a drop-down list:

1. Navigate to the drop-down list in the menu and press **OK**.

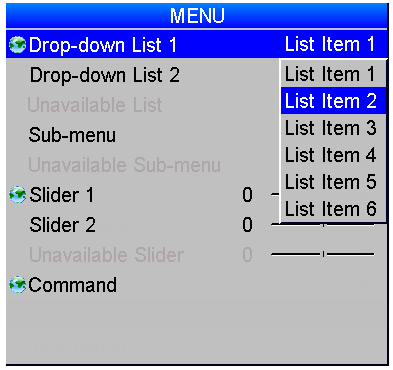


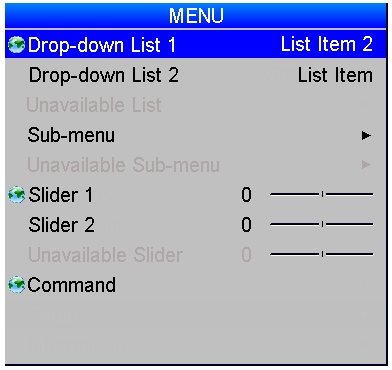
2. Highlight an item from the list using the **UP** and **DOWN** arrow buttons.





3. Press **OK** again to select the highlighted item, or press **EXIT** to exit without changing.





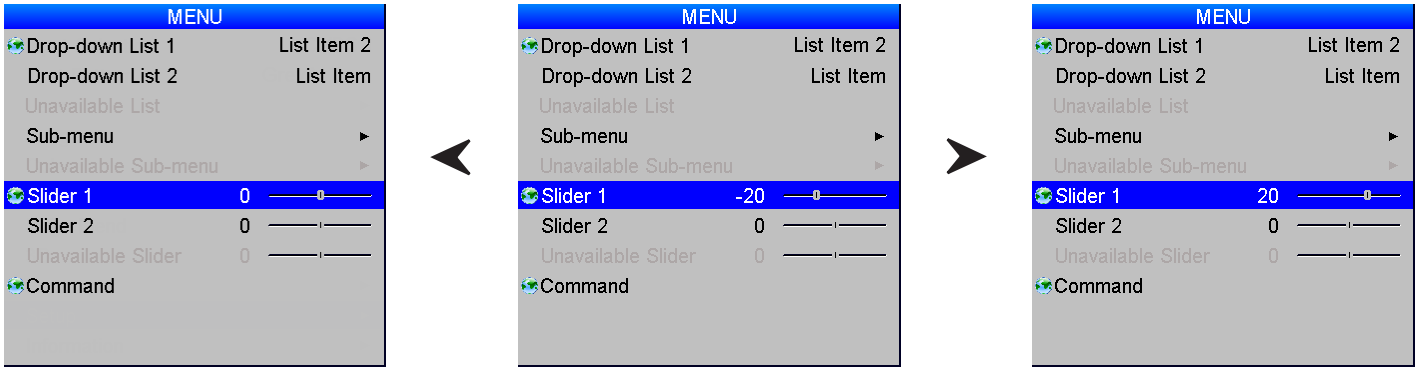
Notes

Some menu items may not be available due to settings in other menus. These will be grayed out on the actual menu.

*When **a globe icon** appears next to a setting, the setting affects all sources and all inputs; otherwise, only the current input source will be affected if you change the setting.*

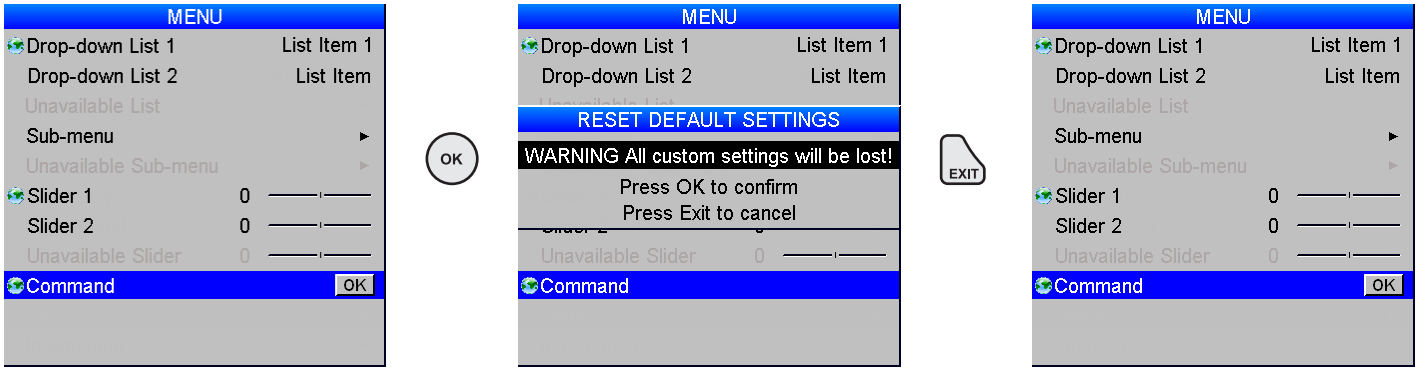
Sliders

To use a slider, press the **LEFT** and **RIGHT** arrow buttons to adjust it.



Commands

To use a command, press **OK**. In the example below, press **OK** to confirm, or press **EXIT** to cancel.



Notes

Some menu items may not be available due to settings in other menus. These will be grayed out on the actual menu.

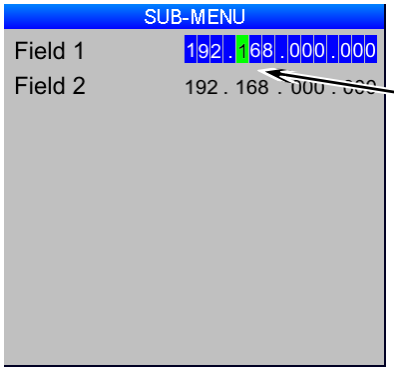
*When **a globe icon** appears next to a setting, the setting affects all sources and all inputs; otherwise, only the current input source will be affected if you change the setting.*

Editing fields

Some features require a text or numeric field to be edited.

1. To edit a field, first select it using the **LEFT** and **RIGHT** arrow buttons, then press **OK**.
2. Use the **LEFT** and **RIGHT** arrow buttons to move the green highlight to the digit or character which is to be changed, then use **UP** and **DOWN** to adjust it.
3. Use the **LEFT** and **RIGHT** arrow buttons to select the next digit or character.
4. Press **OK** to accept the new value, or press **EXIT** to exit without changing.

.



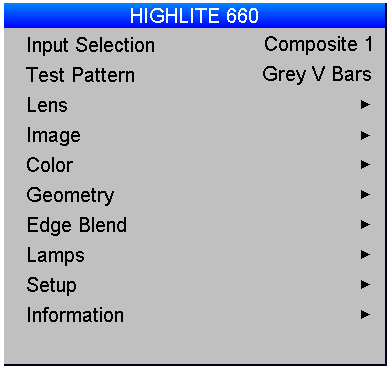
The highlighted digit is being edited

Notes

Some menu items may not be available due to settings in other menus. These will be grayed out on the actual menu.

Using The Projector

Main menu



- **Input Selection**
  Select an input source from the drop-down list.
- **Test Pattern**
  Set **Input Selection** to **Test pattern** and then select a test pattern from the drop-down list.
- **Lens, Image**, **Color** and **Geometry**
  Open these sub-menus to access various picture and screen settings.
- **Edge Blend / PIP**
  PIP and **Edge Blend** are mutually exclusive modes of operation. When the projector is in Edge Blend mode (as shown in the picture), PIP is not available, and vice versa.
- **Lamps**
  Select lamp configuration and adjust lamp power.
- **Setup**
  Adjust Input Configuration, Network, On Screen Display and System settings.
- **Information**
  View your current configuration

Notes

*See also **Using The Menus** earlier in this guide and **Menu Map** later in this guide.*

Main Menu

You can also select an input source by pressing the following buttons on the remote control:
1 for VGA
2 for HDMI 1
3 for DVI 1
4 for 3G-SDI
5 for CVBS 1
6 for S-Video
7 for Component
8 for CVBS 2

Test patterns are subject to image controls, so brightness, contrast etc. will affect their appearance on screen.

Do not use the provided test patterns for ColorMax.

*You can upload custom test patterns using a network connection - see Virtual OSD in the **Protocol Guide**.*

Lens menu

Zoom

To move the lens in or out:

1. Select **Zoom In** or **Zoom Out**, then press **OK**.
2. When the image is the desired size, select **Zoom Stop** and then press **OK**.

Focus

To adjust the focus:

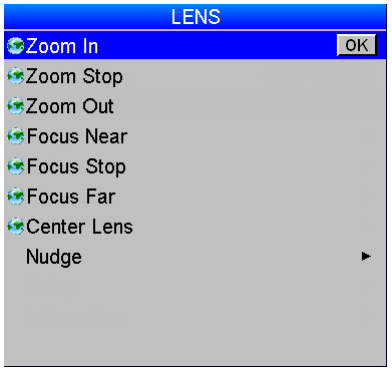
1. Select **Focus Near** or **Focus Far**, then press **OK**.
2. When the image is correctly focussed, select **Focus Stop** and then press **OK**.

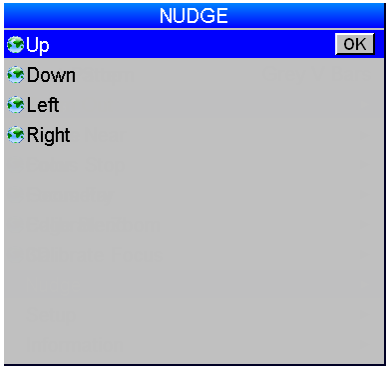
Center Lens

To center the lens, select **Center Lens** and press **OK**.

Nudge

To position the image correctly on the screen, use the **Nudge** controls.





Notes

Main Menu
Lens

You can also move the lens, focus and zoom using the keypad or the remote:

- *Press* **SHIFT** *followed by an arrow button to shift the lens up, down, left and right.*
- *Press* **FOCUS** *followed by the* **UP** *and* **DOWN** *arrow buttons to adjust the focus.*
- *Press* **ZOOM** *followed by the* **UP** *and* **DOWN** *arrow buttons to zoom in and out.*

Main Menu
Lens
Nudge

Image menu

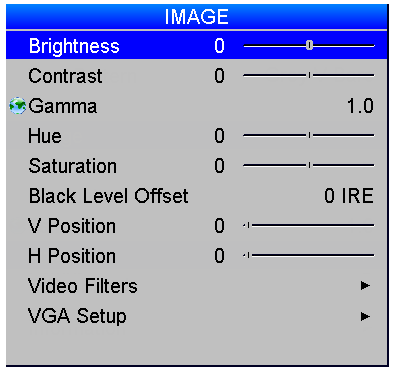
- **Brightness**, **Contrast**, **Gamma**, **Hue** and **Saturation**

  Set the slider or select from the drop-down list as required, to improve the quality of the image.

- **Black Level Offset**

  Set this to **0 IRE** or **7.5 IRE** as required.

- Use **V Position** and **H Position** to adjust the position manually.



Video Filters

Set the sliders or select from the drop-down list as required, to improve the quality of the image:

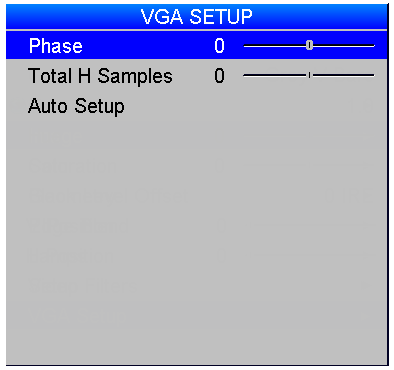
- **Sharpness** - a peaking filter to increase high frequency/luminance information.
- **Detail** - a filter which removes low frequency image components.
- **Luma Sharpness** - a filter which enhances luminance sharpness.
- **Chroma Sharpness** - a filter which enhances the color sharpness of the chrominance signal by increasing the steepness of color edges.
- **Recursive NR** - a noise reduction filter which reduces spatial & temporal noise (only applicable to standard definition video signals).
- **Mosquito NR** - a noise reduction filter which reduces block artifacts (only applicable to standard definition video signals).
- **Cross Color Suppression** - a filter which reduces luminance to chrominance crosstalk on Composite Video signals. The crosstalk appears as a rainbow pattern in regions of fine detail.

VGA Setup

Use **Auto Setup** to allow the projector to detect the appropriate settings automatically.

If you require manual adjustment:

- Set the **Phase** slider to correct for shimmering or poor quality definition on, for example, fine text.
- Set the **Total H Samples** slider to match the resolution of the incoming video signal.



Notes

Main Menu
Image

*You can also press **BRI**, **CON** or **GAMMA** on the remote control.*

Hue applies only to NTSC signals.

*When a new input mode is detected (eg. NTSC, HDTV 1080p, SVGA etc), all the **Input Settings** are saved so that they can be recalled next time that input mode is displayed.*

Main Menu
Image
Video Filters

Main Menu
Image
VGA Setup

VGA Setup is not available unless a VGA signal is present.

Color menu

Gamut

Peak gives you the brightest possible image.

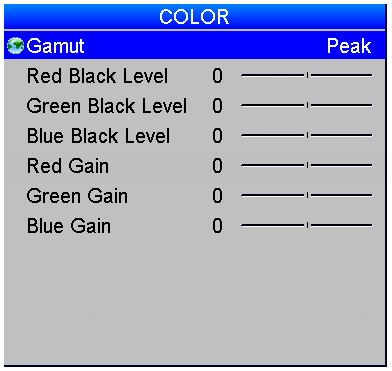
Choose **HDTV** for high definition standards and **SDTV** for standard definition standards.

A value between **3200K** and **9000K** selects the relevant color temperature.

You can upload your own gamut using the Projector Manager software, and then select it from the **User 1** and **User 2** settings.

Black Level and Gain sliders

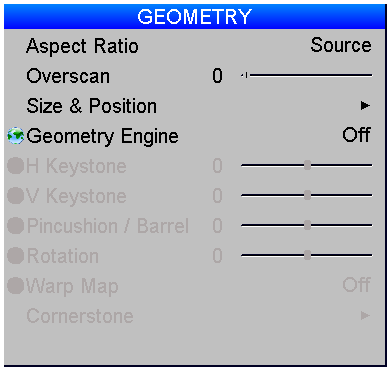
Set the sliders as required.



Notes

Main Menu
Color

Geometry menu



Aspect Ratio

Choose between **Source**, **Fill Display**, **Fill & Crop, Anamorphic and TheaterScope**.

*Some devices (eg certain DVD players) pack a 16:9 image into a 4:3 aspect ratio. In such cases to display the image correctly, choose the **Anamorphic** aspect ratio.*

Overscan

Set this slider to compensate for noisy or badly defined image edges.

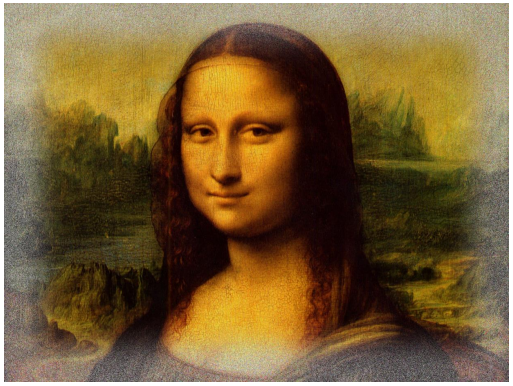
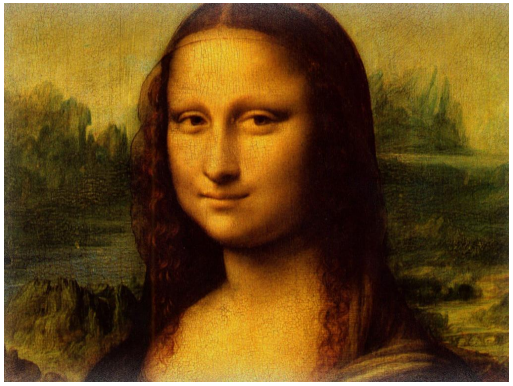


Image with noisy edges



Overscanned image

Notes

Main Menu
Geometry

*An **anamorphic lens** (optional accessory) is used with the **TheaterScope** setting, to ensure that for a **2.35:1** image, the maximum area of the DMD is used, giving maximum image brightness.*

*For examples of how the different aspect ratios affect screen dimensions, see **Aspect Ratios Explained** in the **Reference Guide**.*

*Items on this page may be unavailable depending on the **Geometry Engine** setting.*

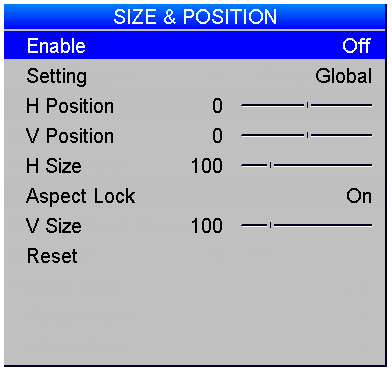
Size & Position

- Set **Enable** to **On** or **Off**.
- Use **Setting** to choose:

  Global, in which case these settings will be applied to all signals on all inputs.

or **Per Mode**, in which case these settings will be applied only to the current input signal.

- Set the **H Position** and **V Position** sliders as required.
- Set **H Size** and **V Size**. When **Aspect Lock** is set to **On**, the **V Size** slider is disabled.
- Select **Reset** and press **OK** to reset all the sliders.



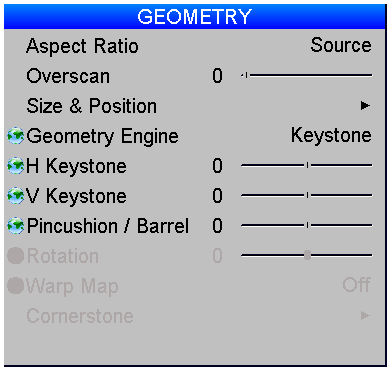
Notes

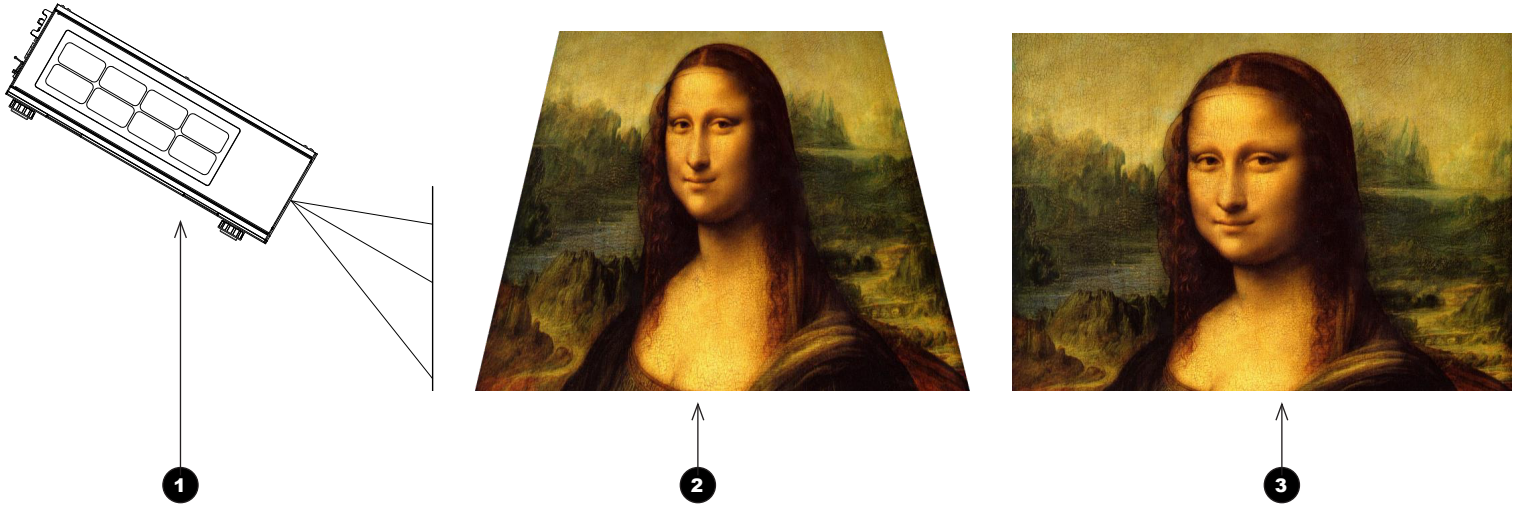
Main Menu
Geometry
Size & Position

Geometry Engine

Choose from **Keystone**, **Cornerstone**, **Rotation**, **Warp** or **Off**.

- If **Geometry Engine** is set to **Keystone**, set the **H Keystone** and **V Keystone** sliders to correct for any distortion caused by the projector being in a different horizontal or vertical plane to the screen.





1 **The projector is positioned at an angle**

2 **The resulting image is distorted**

3 **The image is corrected when Keystone is applied**

Notes

Main Menu
Geometry

Some items on this menu may be unavailable depending on the **Geometry Engine** *setting.*

If possible, position the projector facing the screen at a right angle to avoid geometry corrections.

Geometry Engine (continued)

Keystone settings

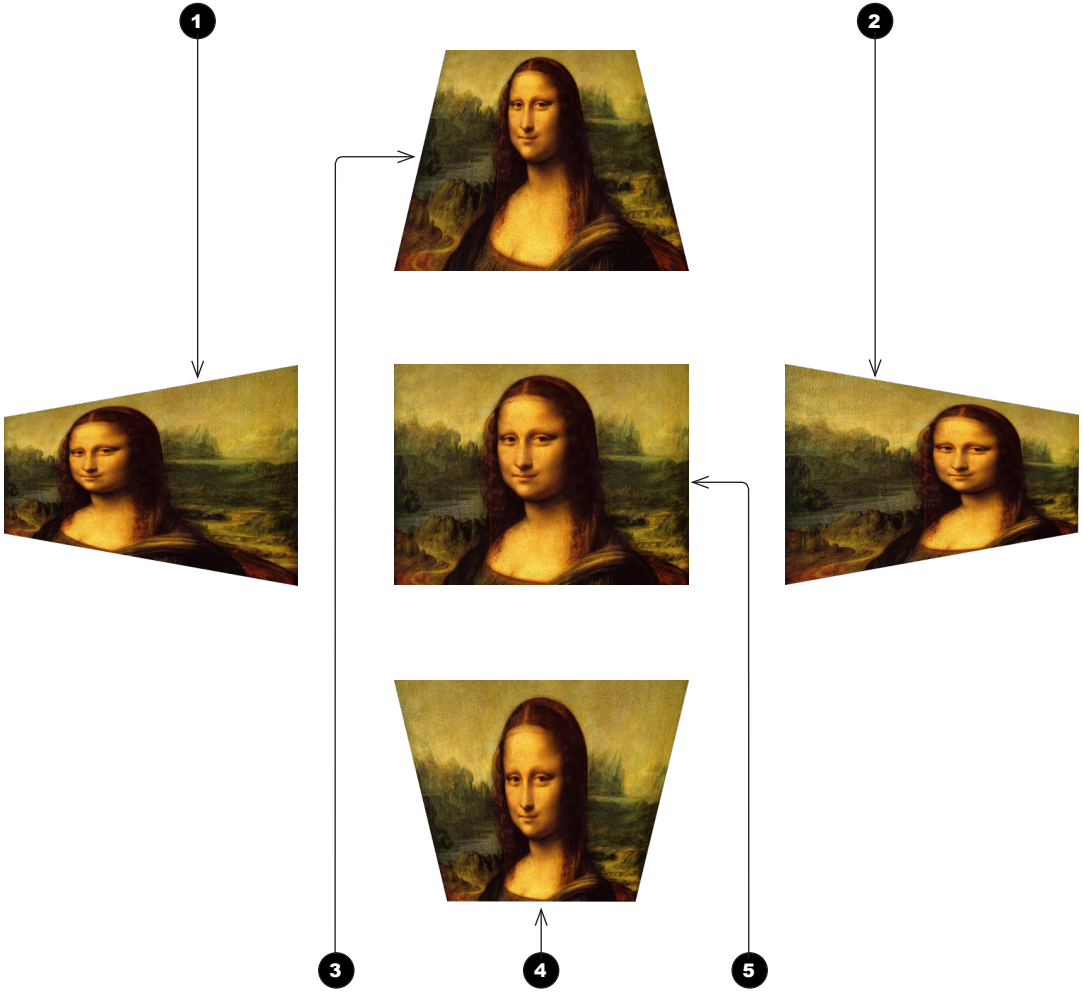
1 **Projector to the left**
The projector is positioned to the left of the screen.
To correct, apply a positive **H Keystone** value using the **RIGHT** arrow button.

2 **Projector to the right**
The projector is positioned to the right of the screen.
To correct, apply a negative **H Keystone** value using the **LEFT** arrow button.

3 **Projector high**
The projector is positioned above the screen at a downward angle.
To correct, apply a negative **V Keystone** value using the **LEFT** arrow button.

4 **Projector low**
The projector is positioned below the screen at an upward angle.
To correct, apply a positive **V Keystone** value using the **RIGHT** arrow button.

5 **Projector straight**
The projector is directly opposite the screen at a right angle both horizontally and vertically.
No correction is needed.



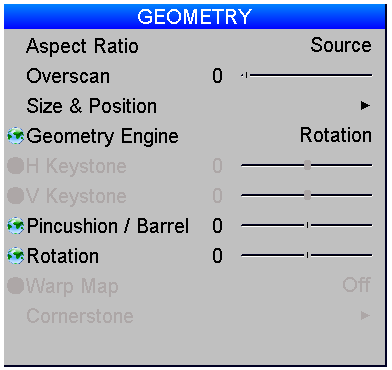
Horizontal and vertical keystone corrections

Notes

Main Menu
Geometry

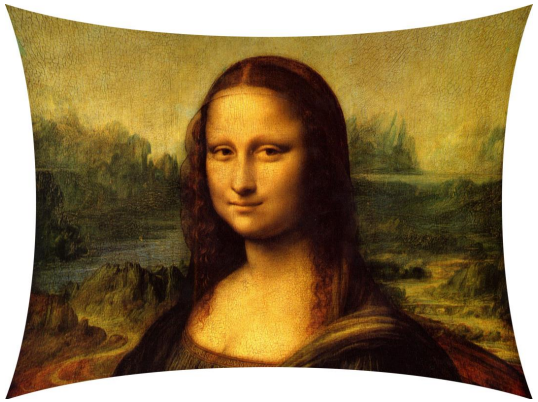
If possible, position the projector facing the screen at a right angle to avoid geometry corrections.

Geometry Engine (continued)

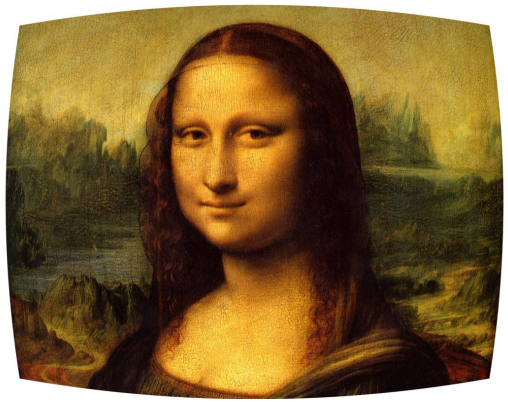


- **Pincushion** / **Barrel** is enabled if **Geometry Engine** is set to ***Keystone*** or ***Rotation***.

  Set the slider to correct for any distortion caused by the screen being concave or convex.



Pincushion



Barrel

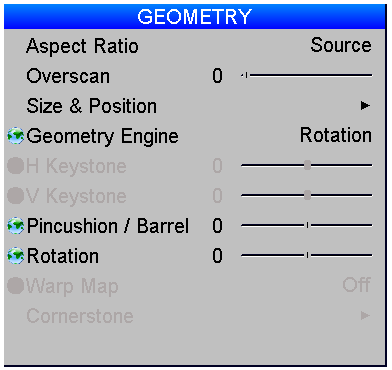
Notes

Main Menu
Geometry

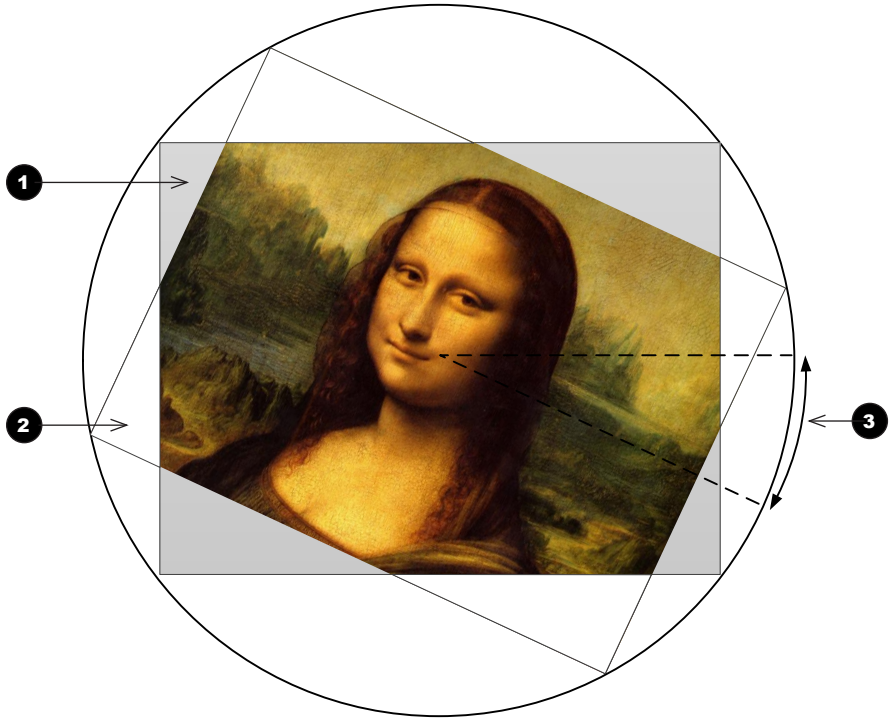
Some items on this menu may be unavailable depending on the **Geometry Engine** *setting.*

If possible, position the projector facing the screen at a right angle to avoid geometry corrections.

Geometry Engine (continued)



- If **Geometry Engine** is set to ***Rotation***, set the **Rotation** slider to rotate the image on the screen.



1. **DMD position**
   The DMD is not rotated.

2. **Area outside DMD**
   The corners of the rotated image leave the DMD and appear cropped.

3. **Angle of rotation**
   The angle equals the **Rotation** setting.
   In this example the angle is 25°, therefore **Rotation = 25**.

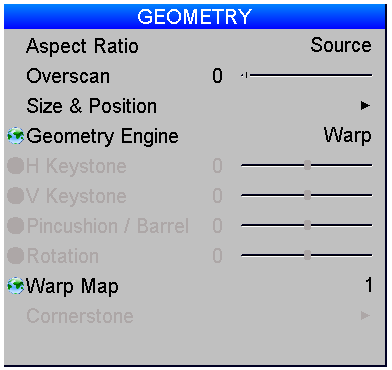
Notes

Main Menu
Geometry

Some items on this menu may be unavailable depending on the **Geometry Engine** *setting.*

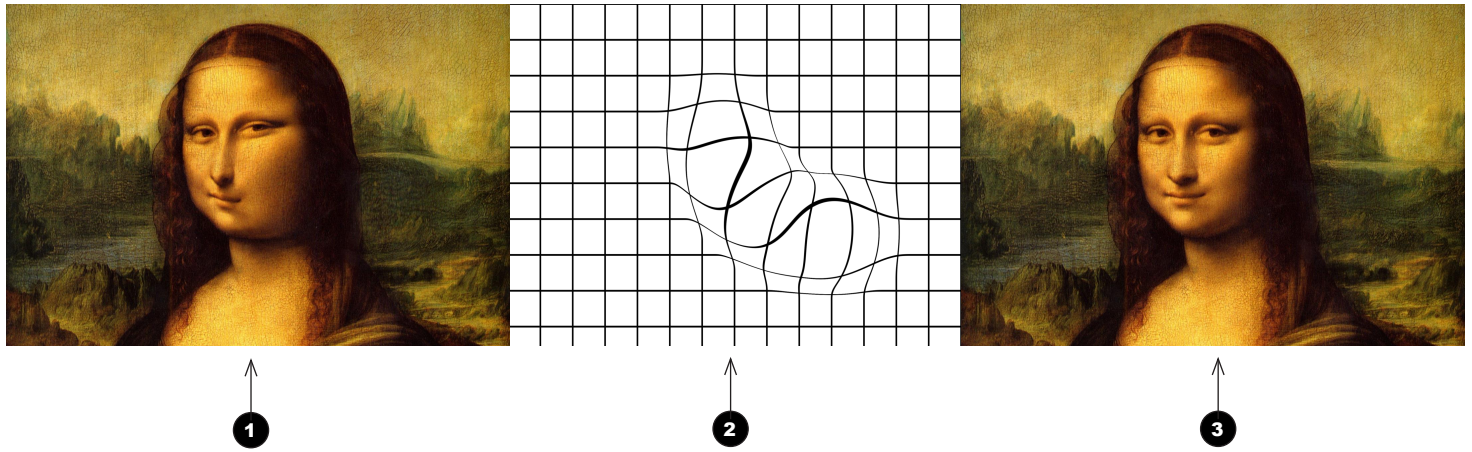
If possible, position the projector facing the screen at a right angle to avoid geometry corrections.

Geometry Engine (continued)



Warp Map

Using ***DP Warp Generator***, an external Digital Projection computer application, up to eight customised warp maps can be created and uploaded to the projector. If **Geometry Engine** is set to ***Warp***, and any warp maps have been uploaded, you can select from the drop-down list.



1 **Distorted image**
The image is projected on an uneven surface.

2 **Warp map**
The map mirrors the surface - raised areas on the surface correspond to hollow areas on the map, and vice versa.

3 **Corrected image**
With the warp map applied, the projector compensates for the surface and the projected image appears undistorted.

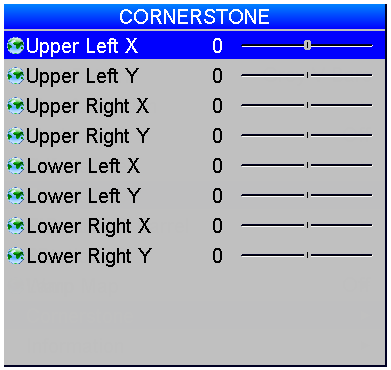
Notes

Main Menu
Geometry

Some items on this menu may be unavailable depending on the **Geometry Engine** *setting.*

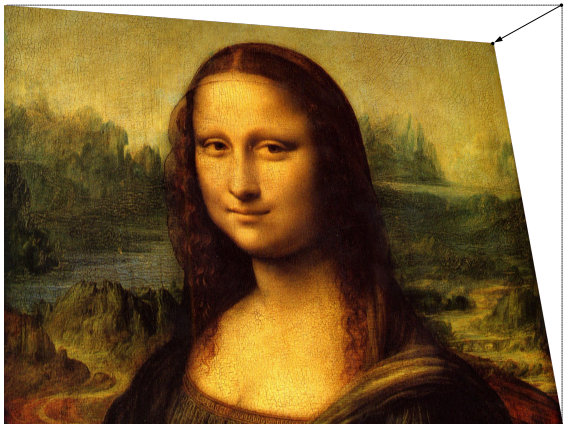
If possible, position the projector facing the screen at a right angle to avoid geometry corrections.

Geometry Engine (continued)



Cornerstone

If **Cornerstone** is selected from the main **Geometry** page, you can use the sliders to stretch the image from each of the four corners.



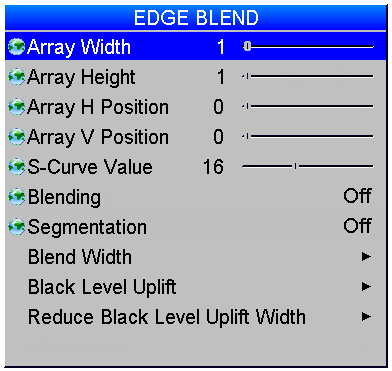
Upper Right X *and* **Upper Right Y** *correction*

Notes

Main Menu
Geometry
Cornerstone

Edge Blend menu

When several projectors are used to create a large tiled image, the edges need to be blended to avoid the overlaps appearing brighter than the rest of the image. The Edge Blend menu is available only when **Setup** > **System** > **Configuration** is set to **Edge Blend**.



Array Width and Height

- Set this to the total number of projectors in the array. None of the other options are available until one of these two settings is greater than **1**. The maximum number of projectors is **4** x **4**.

Array H Position and V Position

- These two parameters need to be set correctly for each projector in the array, so that it can determine which edges are to be blended. Sometimes only one edge overlaps, sometimes two, three or four.

Example

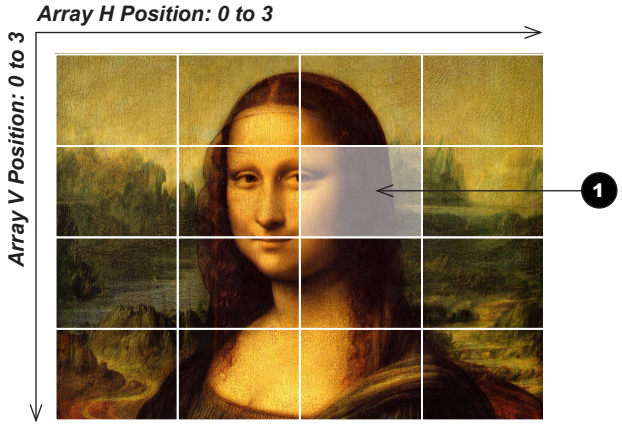
The illustration shows an array of sixteen projectors. **Array Width** and **Array Height** of all projectors have been set up as follows:

- **Array Width** = 4
- **Array Height** = 4

Array H Position and **Array V Position** of each projector have been set up to reflect its vertical and horizontal position in the array.

The settings for ***the third projector in the second row*** (1) are:

- **Array H Position** = 2
- **Array V Position** = 1



Example array of sixteen projectors

Notes

Main Menu
Edge Blend

This menu is available only when **Setup** > **System** > **Configuration** *is set to* **Edge Blend**.

None of the other items in this menu are available until either the **Array Width** *or the* **Array Height** *setting is greater than* **1**.

The position numbering starts from zero, so the top left projector is at position ***H 0, V 0***.

Which settings are available in these menus depends on:

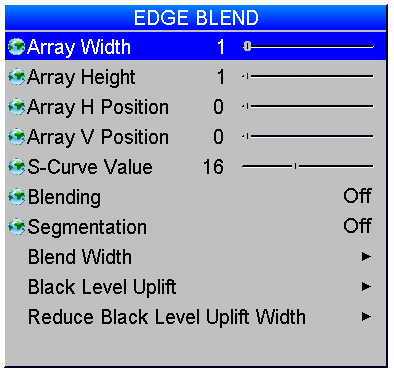
- *the number of projectors in the array*
- *the position of the projector in the array*

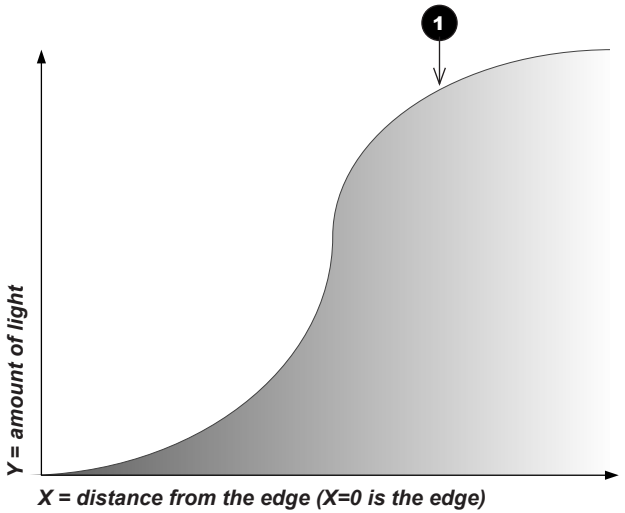
An image like the one shown here can be produced by an array of 16 projectors only if **Segmentation** *is set to* **ON**, *or if an external tool is used to split the image into segments. See* ***Segmentation*** *further in this section.*

For additional information, see ***Edge Blend And Black Level Uplift*** *in the* ***Reference Guide***.

S-Curve Value

- In the regions where two or more projectors overlap, the brightness of the signal is decreased to blend the images. **S-Curve Value** controls the steepness of this decrease.





Notes

Main Menu
Edge Blend

This menu is available only when **Setup** > **System** > **Configuration** *is set to* **Edge Blend**.

None of the other items in this menu are available until either the **Array Width** *or the* **Array Height** *setting is greater than* **1**.

For additional information, see ***Edge Blend And Black Level Uplift*** *in the* ***Reference Guide***.

S-Curve Value (continued)

When images overlap, the area of overlap receives light from all overlapping sources. Without S-Curve, the overlapping edges would be brighter than the rest of the image, as shown in ***Fig. 1***.

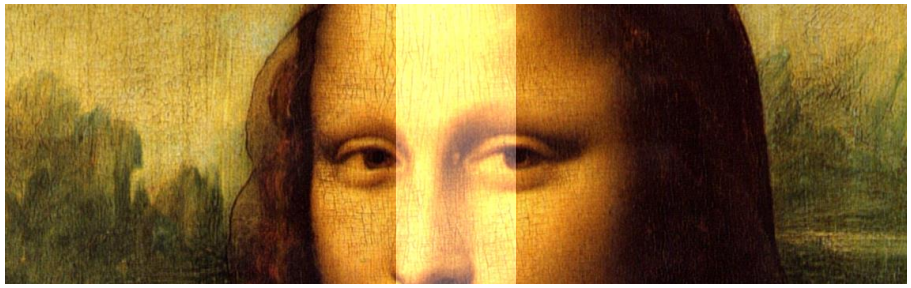


Fig. 1: Overlapping edges without S-Curve

If two reciprocal S-Curves are used to control the amount of light from each source in the overlapping region, the total amount of light in the region would remain constant, as shown in ***Fig. 2***.

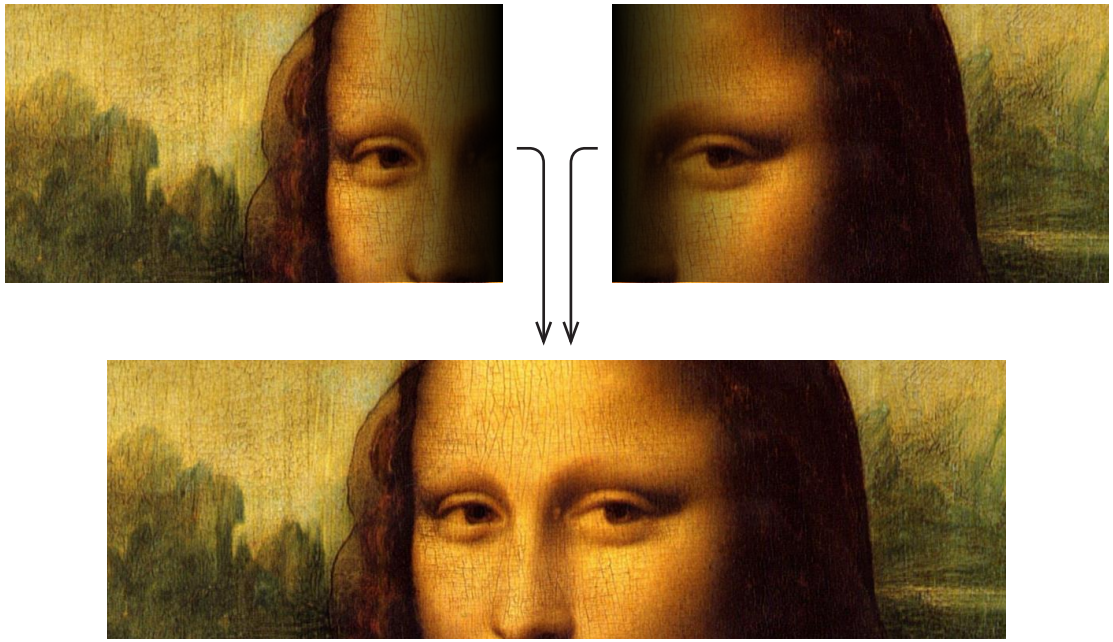


Fig. 2: Applying S-Curve to overlapping edges

Notes

Main Menu
Edge Blend

This menu is available only when **Setup** > **System** > **Configuration** *is set to* **Edge Blend**.

None of the other items in this menu are available until either the **Array Width** *or the* **Array Height** *setting is greater than* **1**.

For additional information, see ***Edge Blend And Black Level Uplift*** *in the* ***Reference Guide***.

Blending

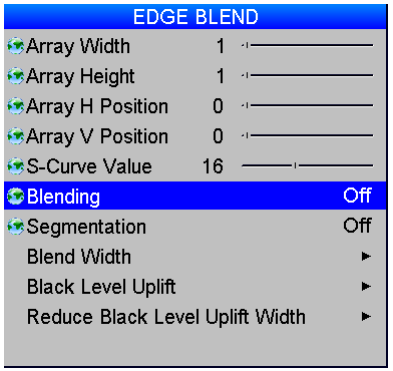
This setting enables s-curve blending, or displays an align pattern to help define overlaps between segments.

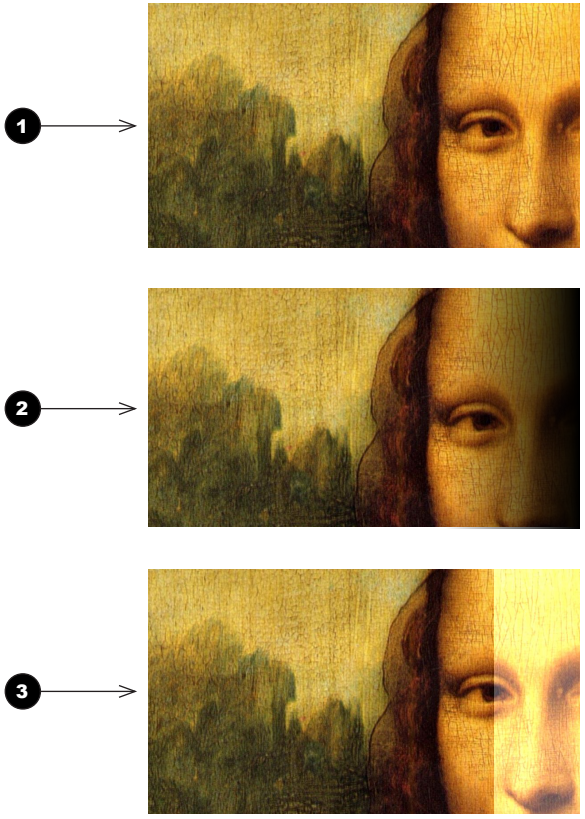
Set **Blending** to:

1. **Off**
   Edge Blend is not used.

2. **On**
   S-curves are enabled in the overlapping regions.

3. **Align Pattern**
   The align pattern makes the overlaps more visible and helps adjust the physical position of the projectors in the array.
   The size of the align pattern is controlled by the **Blend Width** group of settings.





Notes

Main Menu
Edge Blend

This menu is available only when **Setup** > **System** > **Configuration** *is set to* **Edge Blend**.

None of the other items in this menu are available until either the **Array Width** *or the* **Array Height** *setting is greater than* **1**.

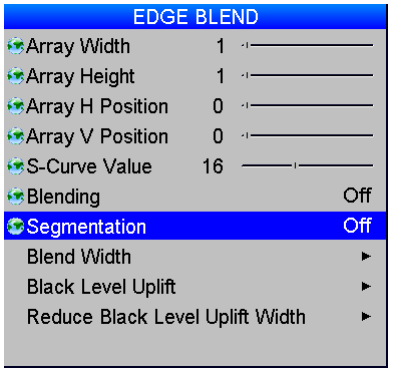
For additional information, see ***Edge Blend And Black Level Uplift*** *in the* ***Reference Guide***.

Segmentation

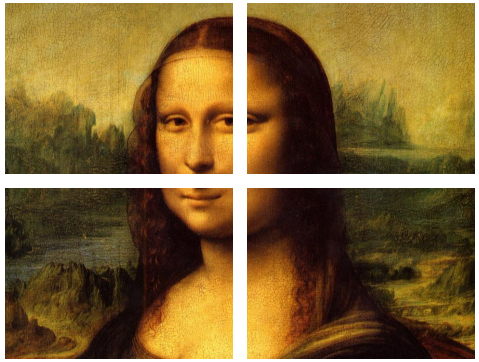
Segmentation can be used if the same image is fed into each projector.

- If **Segmentation** is **Off**, every projector in the array will display the whole image.
- If this setting is **On**, each projector will display its own segment only.

Set to **Off** if you have external software that handles segmentation.



Segmentation off



Segmentation on

Notes

Main Menu
Edge Blend

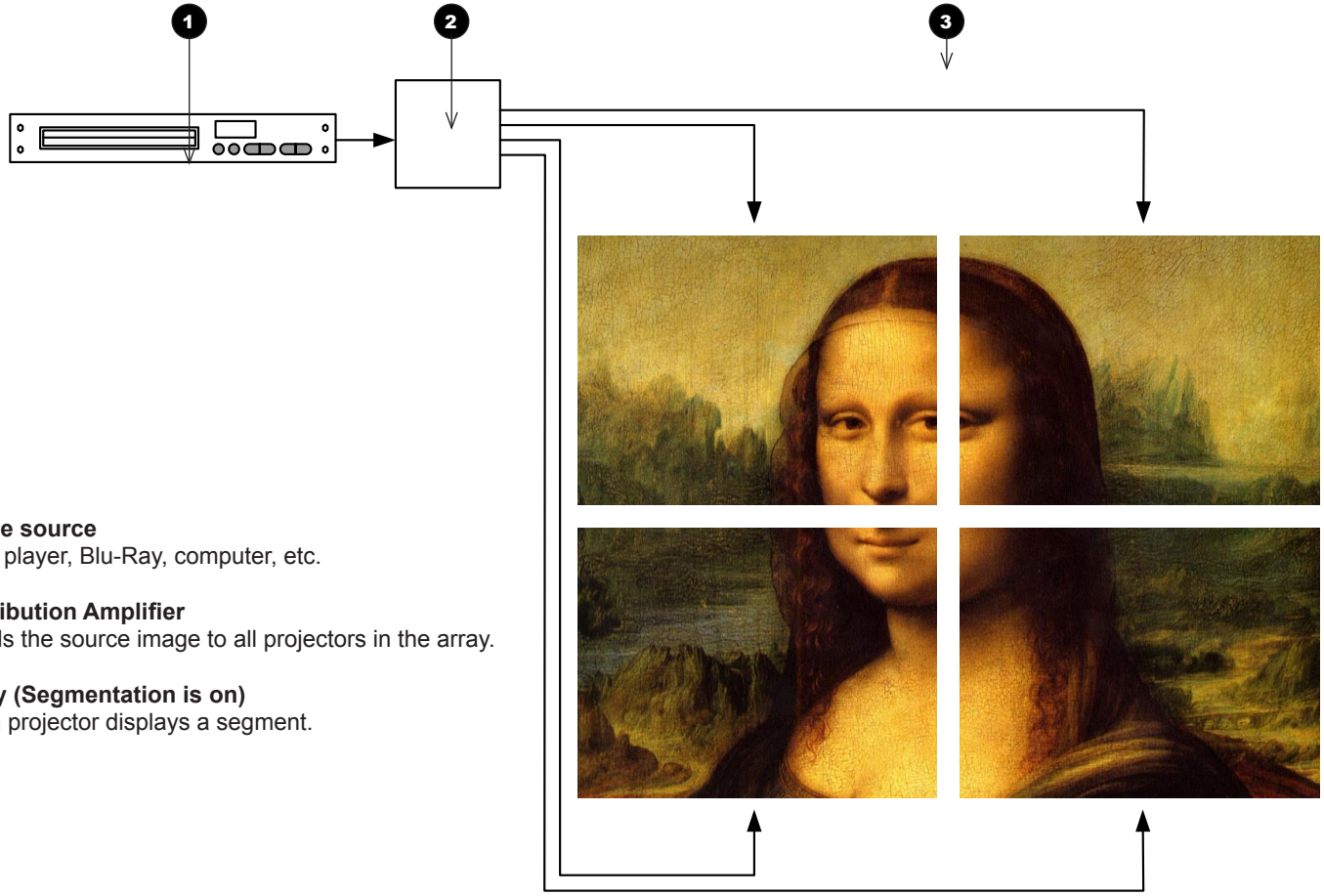
This menu is available only when **Setup** > **System** > **Configuration** *is set to* **Edge Blend**.

None of the other items in this menu are available until either the **Array Width** *or the* **Array Height** *setting is greater than* **1**.

For additional information, see ***Edge Blend And Black Level Uplift*** *in the* ***Reference Guide***.

Segmentation (continued)

An example array:



1 **Image source**
DVD player, Blu-Ray, computer, etc.

2 **Distribution Amplifier**
Sends the source image to all projectors in the array.

3 **Array (Segmentation is on)**
Each projector displays a segment.

Notes

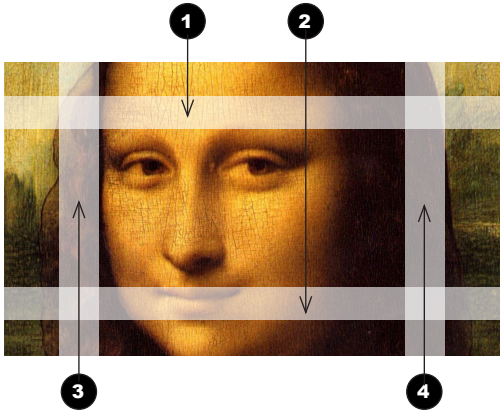
Main Menu
Edge Blend

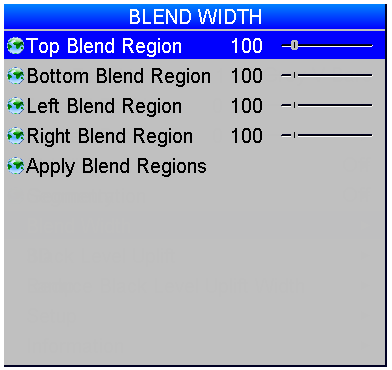
*For additional information, see **Edge Blend And Black Level Uplift** in the **Reference Guide**.*

Blend Width

Use this to set the width of the blended regions.

1. **Top Blend Region**
2. **Bottom Blend Region**
3. **Left Blend Region**
4. **Right Blend Region**





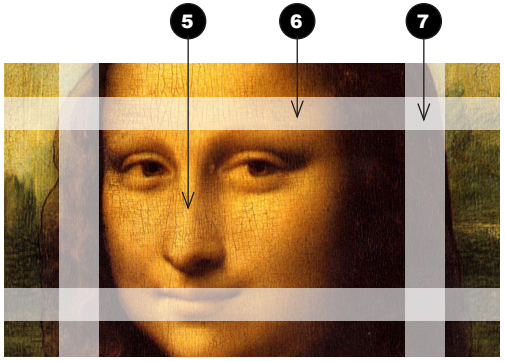
Main Menu
Edge Blend
Blend Width

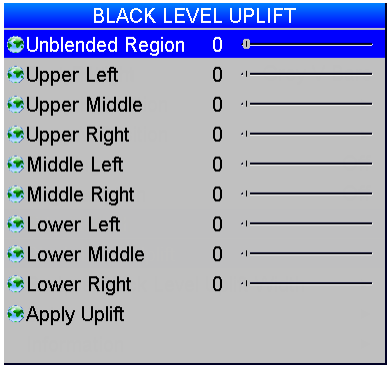
Black Level Uplift

Overlapping edges may appear lighter than the rest of the image. Counteract this effect by raising black levels in the rest of the image. The amount of uplift required will be either x2 or x4, depending on how many images are overlapped.

The following example shows a segment with overlapping edges on all sides.

5. **Unblended Region**
   This region is not overlapped. Black level should be raised by the maximum overlap occurring within the segment, therefore **Black Level Uplift** should be x4.
6. **Upper Middle**
   This section of the image is overlapped by two projectors, therefore the correct amount of **Black Level Uplift** should be x2.
7. **Upper Right**
   This part of the image is overlapped by four projectors, therefore **Black Level Uplift** should not be applied.





Main Menu
Edge Blend
Black Level Uplift

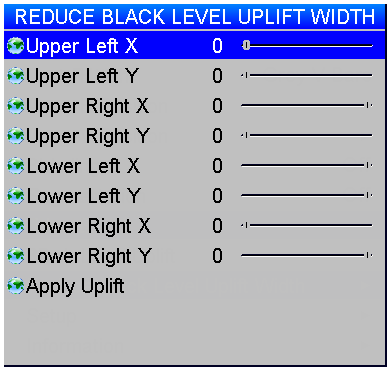
*For additional information, see Edge Blend And Black Level Uplift in the **Reference Guide**.*

Notes

*To apply the settings in these menus, use the **Apply** command at the bottom of each page.*

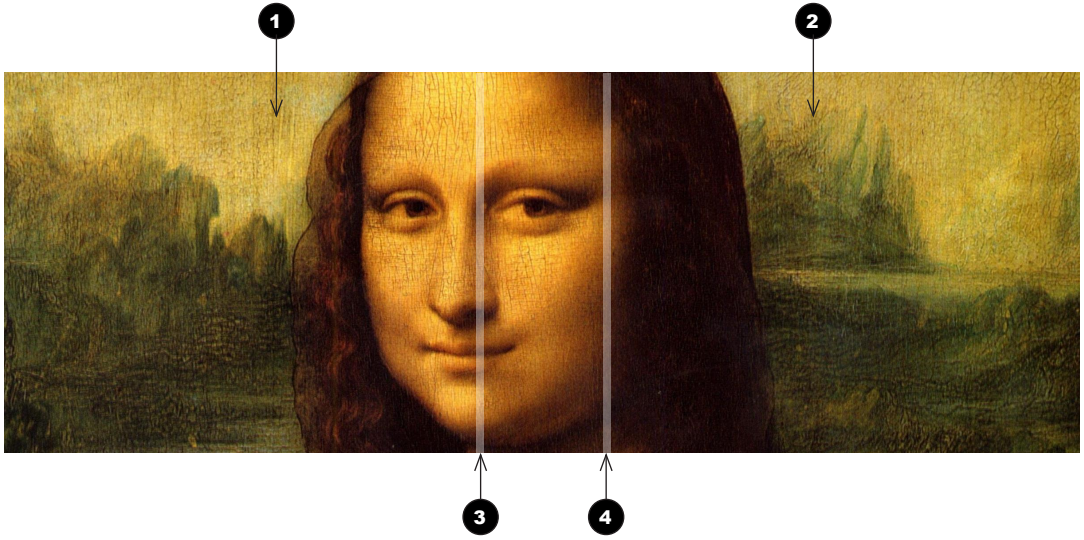
Reduce Black Level Uplift Width

Use this to correct for stray light from the ***pond of mirrors***, the DMD's inactive outermost mirrors.



In the example below, the blended image comes from ***two projectors***, 1 and 2. Both images have black level uplift applied in their unblended regions; as a result, ***artifacts*** 3 and 4 have emerged at the edges where the black level uplift region of one projector overlaps the pond of mirrors of the other.

To remove the artifcats, you need to slightly reduce the size of the black level uplift region of each projector so it does not overlap the pond of mirrors of the other projector.



Notes

Main Menu
Edge Blend
Reduce Black Level Uplift Width

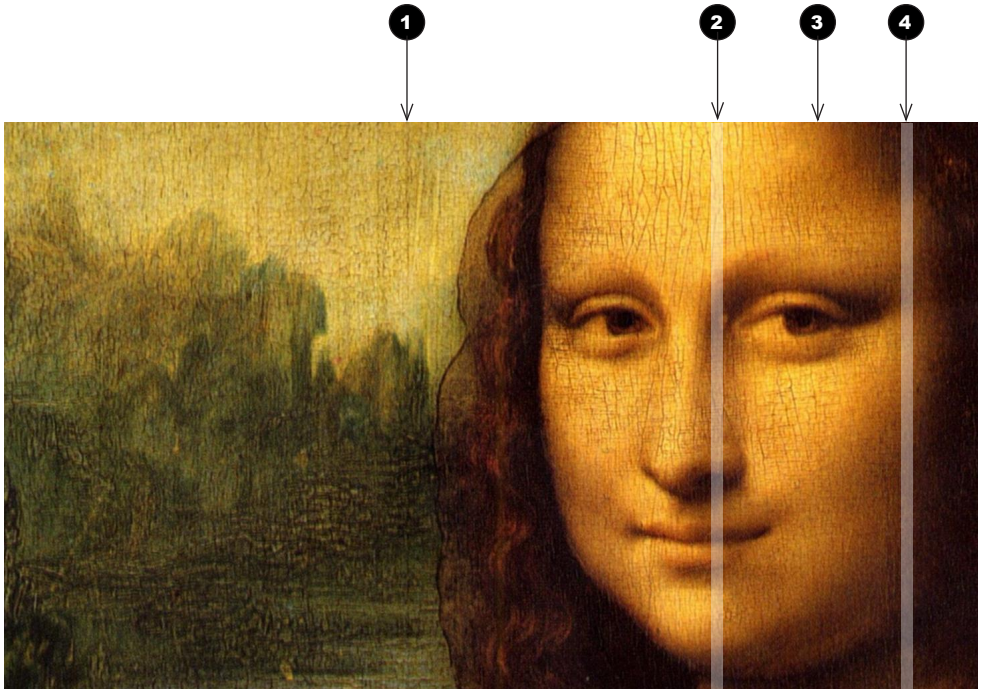
To apply the settings in this menu, use the **Apply Uplift** *command at the bottom of the page.*

For additional information, see ***The DMD™*** *in the* ***Reference Guide****.*

For additional information, see ***Edge Blend And Black Level Uplift*** *in the* ***Reference Guide****.*

Reduce Black Level Uplift Width (continued)

A detailed view of one of the projectors in a two-projector array:



1. **Black level uplift region**
   This image occupies the left half of a two-projector array. Black level uplift has created artifacts on the edges of the blend region.
2. **Artifact (left)**
   This artifact is caused by the other projector's pond of mirrors overlapping the black level uplift region of this projector. It can be eliminated if the black level uplift width of this projector is reduced.
3. **Blend region**
   The area in the middle of the array, where the two images overlap. Black level uplift has not been applied here.
4. **Artifact (right)**
   This artifact is caused by this projector's pond of mirrors overlapping the black level uplift region of the other projector. It can be eliminated if the black level uplift width of the other projector is reduced.

Notes

Main Menu
Edge Blend
Reduce Black Level Uplift Width

*For additional information, see **The DMD™** in the **Reference Guide**.*

*For additional information, see **Edge Blend And Black Level Uplift** in the **Reference Guide**.*

Reduce Black Level Uplift Width (continued)

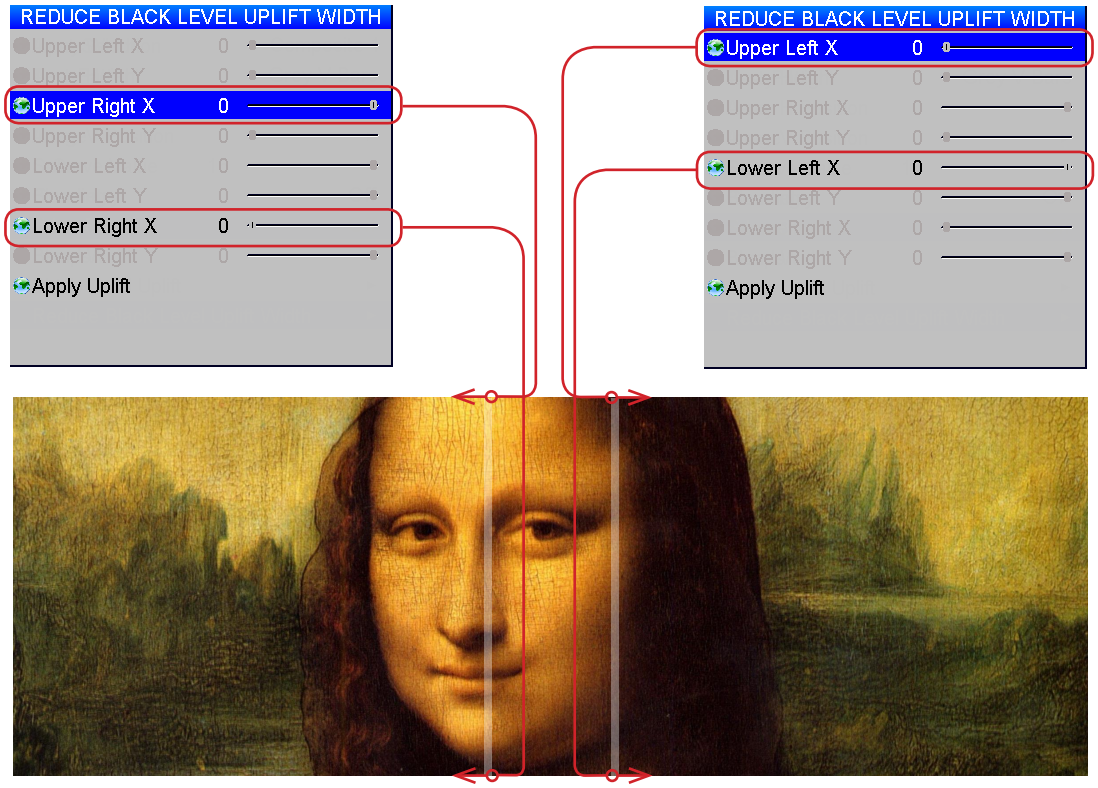
In the **Reduce Black Level Uplift Width** menu, settings correspond to coordinates within the unblended regions. Only relevant coordinates are enabled.

To remove the artifact on the left:

1. Open the **Reduce Black Level Uplift Width** menu of the projector on the left.
2. Adjust **Upper Right X** and **Lower Right X**.
3. Select **Apply Uplift**. The black level uplift region of this projector will withdraw from the pond of mirrors of the other projector and the artifact will disappear.

To remove the artifact on the right,

- Open the **Reduce Black Level Uplift Width** menu of the projector on the right and adjust **Upper Left X** and **Lower Left X**, then select **Apply Uplift**.



Notes

Main Menu
Edge Blend
Reduce Black Level Uplift Width

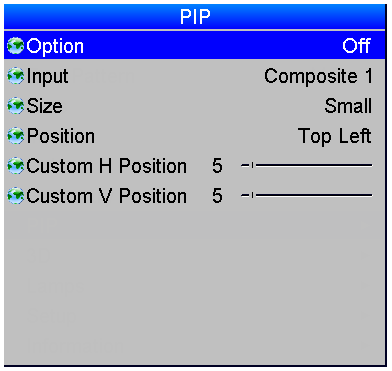
To apply the settings in this menu, use the ***Apply Uplift*** *command at the bottom of the page.*

For additional information, see ***The DMD™*** *in the* ***Reference Guide****.*

For additional information, see ***Edge Blend And Black Level Uplift*** *in the* ***Reference Guide****.*

PIP menu

Two images can be combined, in three different ways using this feature. The PIP menu is available only when **Setup** > **System** > **Configuration** is set to **PIP**.



Option

- Select **PIP**, **PAP**, or **POP** mode from the drop-down list.

Input

- Select an **Input** for the sub-image from the drop-down list. The inputs are divided into two groups – the main image must be from one group, and the sub-image must be from the other group.
  - Group A: **COMPOSITE 1, COMPOSITE 2**, **S-VIDEO** and **3G-SDI**
  - Group B: **COMPONENT, VGA**, **DVI**, **HDMI** and **DVI-A**

  The inputs from the same group as the main input signal will appear disabled in the list.

Size

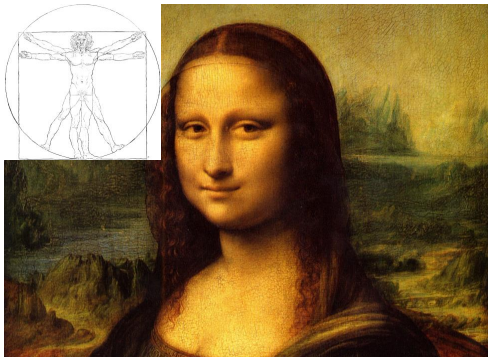
- Select a size for the sub-image from the drop-down list.

Position

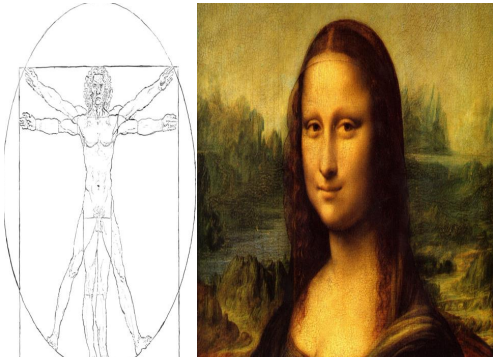
- Select one of the preset positions for the sub-image from the drop-down list.

Custom Position

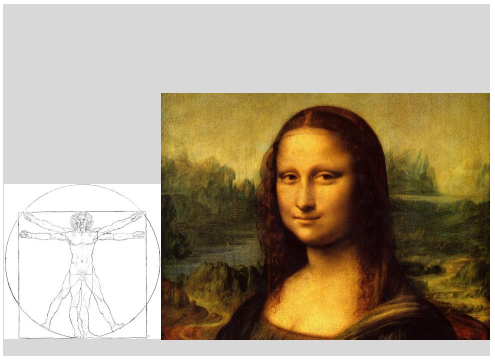
- If you have chosen **Custom** from the **Position** drop-down list, then you can use the sliders to position the image manually.



PIP: Picture In Picture



PAP: Picture And Picture



POP: Picture Opposite Picture

Notes

Main Menu
PIP

This menu is available only when **Setup** > **System** > **Configuration** *is set to* **PIP**.

PIP, **PAP** *and* **POP** *are NOT possible when* **Input** *is set to* **Test Pattern**.

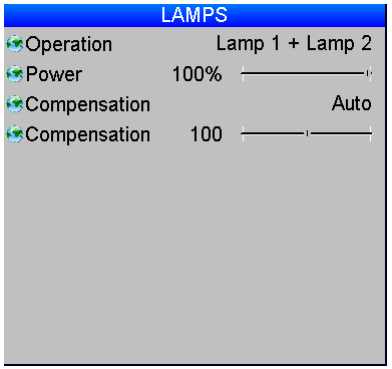
In these examples, the painting is the main image, and the test pattern is the sub-image, shown at the **Medium** *size setting.*

The **Position** *settings apply ONLY to* **PIP** *mode. PAP and POP are always as shown in these examples.*

Lamps menu

Set **Operation** to choose between **Lamp 1 + Lamp 2**, **Lamp 1**, **Lamp 2** and **Auto 1**. In the **Auto 1** mode, the lamp usage will be spread evenly over the two lamps, over time.

Set the slider to vary the **Power** between 85% and 100%.



If you have rented the projector from a dealer, the projector may have been shipped with one lamp deactivated to lower the rental cost. You can reactivate the lamp (at extra cost) using the **Feature Control** setting in the ***Setup > System*** menu.

Notes

Main Menu
Lamps

Running the lamps at a lower power will increase their expected lifetime.

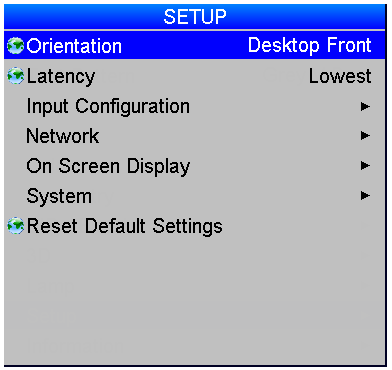
Setup menu

- **Orientation**

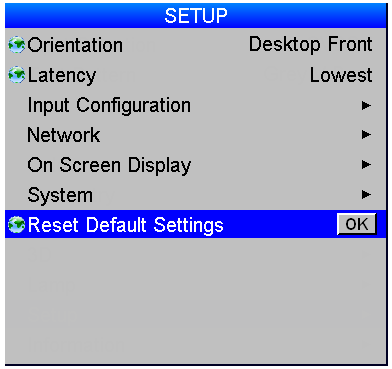
  Depending on how the projector is mounted, select the appropriate setting from the drop-down list.

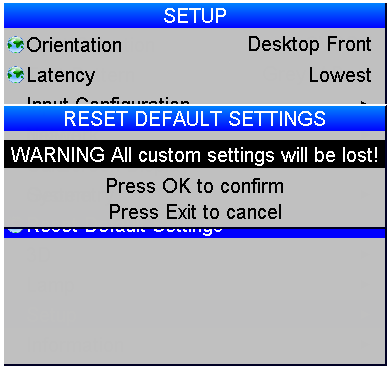
- **Latency**

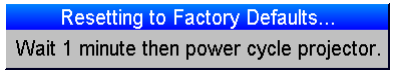
  Affects interlaced sources only. For fastest response, the **Lowest** setting gives minimum frame delay. For improved performance with films involving motion sequences, the **Best Video** setting uses adaptive de-interlacing and interpolation, but takes longer to process.



Reset Default Settings







When you press **OK** to restore the factory default settings, a warning message appears, asking you to confirm or cancel.

Once the process has begun, wait one minute and then power cycle the projector so the restored settings can take effect.

Notes

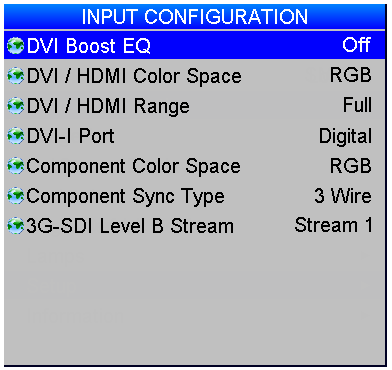
Main Menu
Setup

Do NOT do this unless you are sure that you want to restore ALL the current settings to their factory defaults.

Input Configuration

This menu allows adjustment of various technical parameters specific to each of the signal inputs:

- **DVI Boost EQ** should normally be set to **Off,** except when you are having problems with a long DVI cable.
- **DVI / HDMI Color Space** should normally be set to **Auto**, except when the projector has problems identifying the correct colour space.
- **DVI / HDMI Range** should normally be set to **Auto**, except when you are having contrast problems with some DVI sources.
- Set **DVI Port** to choose between the **Analog** and **Digital** signals from a DVI-I source.
- Set **Component Colour Space** to choose between **RGB** and **YPbPr**.
- **Component Sync Type** should be set to **Auto**, except when the projector has problems selecting between **3 Wire** (RGsB) and **4 Wire** (RGBS).
- If two video streams are being transmitted, use **3G-SDI Level B Stream** to choose between the two streams.


INPUT CONFIGURATION
DVI Boost EQ Off
DVI / HDMI Color Space RGB
DVI / HDMI Range Full
DVI-I Port Digital
Component Color Space RGB
Component Sync Type 3 Wire
3G-SDI Level B Stream Stream 1

Notes

Main Menu
Setup
Input Configuration

Network

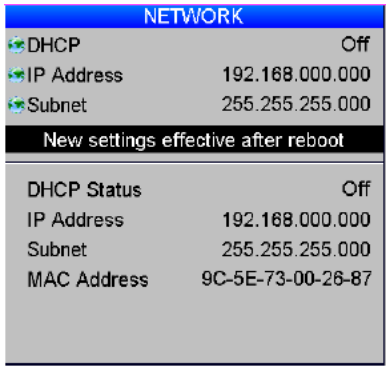
The fields at the bottom of the menu show the current settings.

- Set **DHCP** to **On** if the IP Address is to be assigned by a DHCP server, or **Off** if it is to be set here.
- If **DHCP** is set to **On:**

  It will not be possible to edit either IP Address or Subnet.
- If **DHCP** is set to **Off:**

  Edit **IP Address** to the correct value.

  Edit the **Subnet** to the correct value.



Notes

Main Menu
Setup
Network

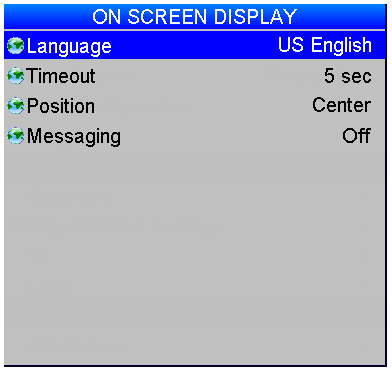
Any new settings will not be effective until the projector has been power cycled.

If the first digit of an address octet is set to "2", then it will not be possible to enter values above 5 for the second or third digits. To overcome this, set the first digit to either "0" or "1". You can set the first digit back to "2" later if necessary.

On Screen Display

- Select a display **Language** from the drop-down list.
- The menus will disappear if no buttons are pressed within the **Timeout** selected from the drop-down list. If you want the menus to stay on screen permanently, then select **Infinite**.
- Select a **Position** from the drop-down list.
- If you do not want projector status messages to be displayed, for instance

, then set **Messaging** to **Off**.



Notes

Main Menu
Setup
On Screen Display

System

- **Configuration**: switch between **PIP** and **Edge Blend**.
- Use **IR Address** to set an address for the remote control.

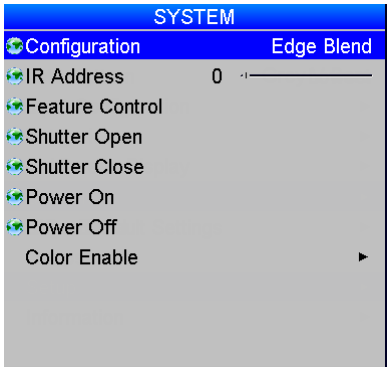
The other settings in this menu are provided mainly to allow control from the Virtual OSD.

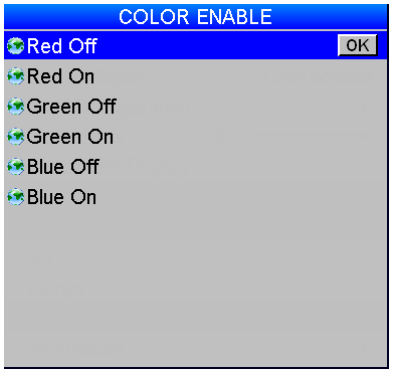
- **Feature Control**

  If you have rented the projector from a dealer, the projector may have been shipped with a deactivated lamp to lower the rental cost. If more brightness is needed, this lamp can be activated (at extra cost) by obtaining an unlock PIN code from your dealer.

  Once you have entered the PIN code using this control, you will need to reboot the projector to enable the extra lamp.

- Use the **Shutter Open** and **Shutter Close** commands as required.
- Use the **Power Off** command to set the projector into **Standby** mode.
- Use the **Color Enable** sub-menu to switch individual colors on and off.





Notes

Main Menu
Setup
System

When you switch between **PIP** *and* **Edge Blend**, *the projector will reboot instantly to enable the new setting.*

IR Address *is set separately for the projector and the remote, to a matching value - see* ***Setting up an IR address*** *later in this guide.*

The **Power On** *command has no function when seen on the projector OSD. However, it can be used from the Virtual OSD described in the* ***Protocol Guide****.*

Both the keypad and remote control have dedicated buttons allowing access to the **Shutter Open**, **Shutter Close**, **Power On** *and* **Power Off** *commands.*

Main Menu
Setup
System
Color Enable

Do not switch off all colors at the same time. In the event of this happening, power cycle the projector to restore the default settings.

At power on, all colors are enabled regardless of the previous setting.

Setting up an IR address

The projector and the remote control need a matching IR address: a two-digit number between 00 and 99.

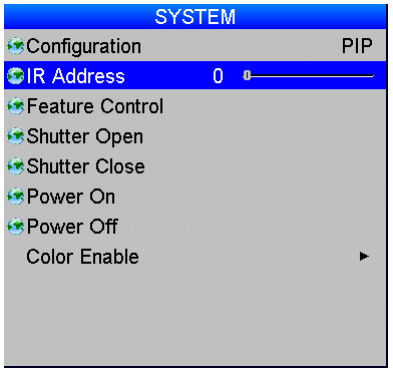
The default IR address is 00. This is also a master address, which, if assigned to a remote, will work regardless of the value assigned to the projector.

To assign an IR address for the projector,

- Open the OSD, access ***Setup > System*** and select **IR Address**.

To assign IR address for the remote:

1. Press and hold the **ADDR** button on the remote.
2. Press two number buttons sequentially to enter the address. For numbers less than 10, use a leading zero.
3. Release the **ADDR** key.
   The transmit indicator on the remote will flash twice to confirm the setting.



Notes

Main Menu
Setup
System

Change the IR address of the projector before changing the address of the remote. You can check the value assigned to the projector by using the control panel to access **Setup > System**. *However, you cannot check the value assigned to the remote.*

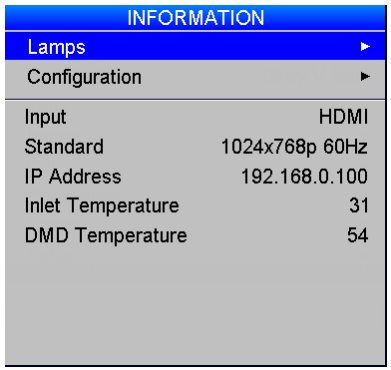
In the event of a mismatch between the projector and the remote, change the remote IR address to the master address or to the projector address. To check the projector address, access **Setup > System** *using the control panel.*

When fresh batteries are inserted in the remote control, it will revert to the default address 00. If you have previously assigned a different address, you need to change it manually.

If two or more projectors are assigned the same address, they can be controlled from one remote control, provided they are connected by cable or in range of the infrared.

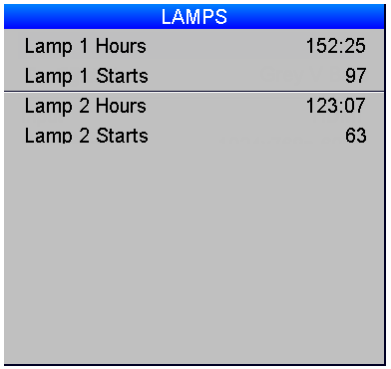
Information menu

This menu gives information about lamp operating times, software and hardware configuration, input source and network settings.



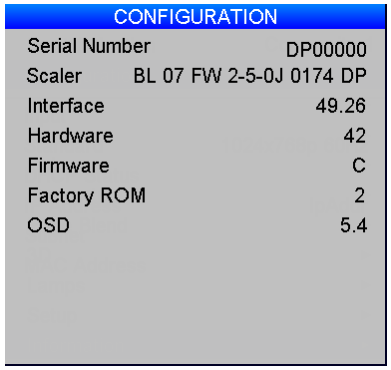
Lamps

This menu gives information about lamp hours and starts.



Configuration

This menu gives information about various projector components. If you need to contact your dealer about an issue with the projector, they may want you to quote some of the information shown on this page to help diagnose the problem.



Notes

Please note that the values shown in the menus on this page are examples and may differ significantly on your OSD.

Main Menu
Information

Main Menu
Information
Lamps

Main Menu
Information
Configuration

Menu Map

Main Menu — ***Sub Menus***

Input Selection

Composite 1, Composite 2, S-Video, Component, VGA, 3G-SDI, DVI, HDMI, Test Pattern

Test Pattern

Gray V Bars, Gray H Bars, Aspect Test, Alignment Grid, Warp Adjust, SMPTE, Chequerboard, White Field, Black Field, Screen Layout

Lens

Zoom In *(command)*
Zoom Stop *(command)*
Zoom Out *(command)*
Focus Near *(command)*
Focus Stop *(command)*
Focus Far *(command)*
Center Lens *(command)*
Nudge
- Up *(command)*
- Down *(command)*
- Left *(command)*
- Right *(command)*

Notes

Some of the information in this menu map is summarised. See the actual menu on the projector for full detail.

The underlined text represents the factory default value for each setting.

Main Menu	*Sub Menus*
Image	
	Brightness *(slider, value range -50 ~ 50 [0])*
	Contrast *(slider, value range -50 ~ 50 [0])*
	Gamma *1.0, 1.8, 2.0, 2.2, 2.4, 2.6, 2.8*
	Hue *(slider, value range -50 ~ 50 [0])*
	Saturation *(slider, value range -50 ~ 50 [0])*
	Black Level Offset *0 IRE, 7.5 IRE*
	Video Filters
	Sharpness *(slider, value range -50 ~ 50 [0])*
	Detail *(slider, value range 0 ~ 3)*
	Luma Sharpness *(slider, value range 0 ~ 2)*
	Chroma Sharpness *(slider, value range 0 ~ 2)*
	Recursive NR *(slider, value range 0 ~ 3)*
	Mosquito NR *(slider, value range 0 ~ 3)*
	Cross Color Suppression *Off, On*
	VGA Setup
	Phase *(slider, value range -50 ~ 50 [0])*
	Total H Samples *(slider, value range -50 ~ 50 [0])*
	Auto Setup *(command)*
Color	
	Gamut *Peak, HDTV, SDTV, 3200k, 5400k, 6500k, 8000k, 9000k, User 1, User 2*
	Red Black Level *(slider, value range -50 ~ 50 [0])*
	Green Black Level *(slider, value range -50 ~ 50 [0])*
	Blue Black Level *(slider, value range -50 ~ 50 [0])*
	Red Gain *(slider, value range -50 ~ 50 [0])*
	Green Gain *(slider, value range -50 ~ 50 [0])*
	Blue Gain *(slider, value range -50 ~ 50 [0])*

Notes

Some of the information in this menu map is summarised. See the actual menu on the projector for full detail.

The underlined text represents the factory default value for each setting.

Main Menu ***Sub Menus***

Geometry

Aspect Ratio *Source, Fill Display, Fill & Crop, Anamorphic, TheaterScope*

Overscan *(slider, value range 0 ~ 3)*

Size & Position

- Enable *Off, On*
- Setting *Global, Per Mode*
- H Position *(slider, value range -100 ~ 100 [0])*
- V Position *(slider, value range -100 ~ 100 [0])*
- H Size *(slider, value range 25 ~ 400 [100])*
- Aspect Lock *On, Off*
- V Size *(slider, value range 25 ~ 400 [100])*
- Reset *(command)*

Geometry Engine *Off, Keystone, Cornerstone, Rotation, Warp*

H Keystone *(slider, value range -50 ~ 50 [0])*

V Keystone *(slider, value range -50 ~ 50 [0])*

Pincushion / Barrel *(slider, value range 30 ~ 30 [0])*

Rotation *(slider, value range --90 ~ 90 [0])*

Warp Map *Off, 1, 2, 3, 4, 5, 6, 7, 8*

Cornerstone

- Upper Left X *(slider, value range -500 ~ 500 [0])*
- Upper Left Y *(slider, value range -500 ~ 500 [0])*
- Upper Right X *(slider, value range -500 ~ 500 [0])*
- Upper Right Y *(slider, value range -500 ~ 500 [0])*
- Lower Left X *(slider, value range -500 ~ 500 [0])*
- Lower Left Y *(slider, value range -500 ~ 500 [0])*
- Lower Right X *(slider, value range -500 ~ 500 [0])*
- Lower Right Y *(slider, value range -500 ~ 500 [0])*

Notes

Some of the information in this menu map is summarised. See the actual menu on the projector for full detail.

The underlined text represents the factory default value for each setting.

Main Menu ***Sub Menus***

Edge Blend

Array Width *(slider, value range 1 ~ 4)*

Array Height *(slider, value range 1 ~ 4)*

Array H Position *(slider, value range 0 ~ 3)*

Array V Position *(slider, value range 0 ~ 3)*

S-Curve Value *(slider, value range 10 ~ 25)*

Blending *Off, On, Align Pattern*

Segmentation *Off, On*

Blend Width

- Top Blend Region *(slider, value range 0 ~ 999)*
- Bottom Blend Region *(slider, value range 0 ~ 999)*
- Left Blend Region *(slider, value range 0 ~ 999)*
- Right Blend Region *(slider, value range 0 ~ 999)*
- Apply Blend Regions *(command)*

Black Level Uplift

- Unblended Region *(slider, value range 0 ~ 63)*
- Upper Left *(slider, value range 0 ~ 63)*
- Upper Middle *(slider, value range 0 ~ 63)*
- Upper Right *(slider, value range 0 ~ 63)*
- Middle Left *(slider, value range 0 ~ 63)*
- Middle Right *(slider, value range 0 ~ 63)*
- Lower Left *(slider, value range 0 ~ 63)*
- Lower Middle *(slider, value range 0 ~ 63)*
- Lower Right *(slider, value range 0 ~ 63)*
- Apply Uplift *(command)*

Reduce Black Level Uplift Width

- Upper Left X *(slider, value range 0 ~ 200)*
- Upper Left Y *(slider, value range 0 ~ 200)*
- Upper Right X *(slider, value range -200 ~ 0)*
- Upper Right Y *(slider, value range 0 ~ 200)*
- Lower Left X *(slider, value range -200 ~ 0)*
- Lower Left Y *(slider, value range -200 ~ 0)*
- Lower Right X *(slider, value range 0 ~ 200)*
- Lower Right Y *(slider, value range -200 ~ 0)*
- Apply Uplift *(command)*

Notes

Some of the information in this menu map is summarised. See the actual menu on the projector for full detail.

The underlined text represents the factory default value for each setting.

PIP *and* **Edge Blend** *are mutually exclusive modes of operation. When in PIP mode, Edge Blend is not available, and vice versa.*

Main Menu	*Sub Menus*
PIP	
	Option *Off, PIP, PAP, POP*
	Input *CVBS 1, CVBS 2, S-Video, Component, VGA, 3G-SDI, DVI, HDMI*
	Size *Small, Medium, Large*
	Position *Top Left, Top Right, Bottom Left, Bottom Right, Custom*
	Custom H Position *(slider, value range 0 ~ 100 [50])*
	Custom V Position *(slider, value range 0 ~ 100 [50])*
Lamps	
	Operation *Lamp 1 + Lamp 2, Lamp 1, Lamp 2, Auto 1*
	Power *(slider, value range 85 — 100)*

Notes

- *Some of the information in this menu map is summarised. See the actual menu on the projector for full detail.*
- *The underlined text represents the factory default value for each setting.*
- **PIP** *and* **Edge Blend** *are mutually exclusive modes of operation. When in PIP mode, Edge Blend is not available, and vice versa.*

Main Menu ***Sub Menus***

Setup

Orientation *Desktop Front, Desktop Rear, Ceiling Front, Ceiling Rear*

Latency *Lowest, Best Video*

Input Configuration

- DVI Boost EQ *Off, On*
- DVI / HDMI Color Space *RGB, YPbPr, Auto*
- DVI / HDMI Range *Full, Limited, Auto*
- DVI-I Port *Digital, Analog*
- Component Color Space *RGB, YPbPr*
- Component Sync Type *3 Wire, 4 Wire, Auto*
- 3G-SDI Level B Stream *Stream 1, Stream 2*

Network

- DHCP *Off, On*
- IP Address (*numeric input)*
- Subnet (*numeric input)*
- *Information: DHCP Status, IP Address, Subnet, MAC Address*

On Screen Display

- Language *US English, UK English*
- Timeout *5 sec, 10 Sec, 15 sec, 20 sec, 25 sec, 30 sec, infinite*
- Position *Center, Top Left, Top Right, Bottom Left, Bottom Right*
- Messaging *Off, On*

System

- Configuration *PIP, Edge Blend*
- Shutter Open *(command)*
- Shutter Close *(command)*
- IR Address *(slider, value range 0 ~ 99 [0])*
- Power On *(command)*
- Power Off *(command)*
- **Color Enable**
  - Red Off *(command)*
  - Red On (*command)*
  - Green Off *(command)*
  - Green On *(command)*
  - Blue Off *(command)*
  - Blue On *(command)*

Reset Default Settings *(command)*

Notes

Some of the information in this menu map is summarised. See the actual menu on the projector for full detail.

The underlined text represents the factory default value for each setting.

Do NOT reset the settings unless you are sure that you want to restore ALL the current settings to their factory defaults.

Main Menu	*Sub Menus*
Information	
	Lamps
	Lamp 1 Hours, Lamp 1 Starts, Lamp 2 Hours, Lamp 2 Starts
	Configuration
	Serial Number, Scaler, Interface, Hardware, Firmware, Factory ROM, OSD
	Input
	Standard
	IP Address
	Inlet Temperature
	DMD Temperature

Notes

Some of the information in this menu map is summarised. See the actual menu on the projector for full detail.

DIGITAL PROJECTION

REFERENCE GUIDE

HIGHlite 660 Series

High Brightness Digital Video Projector

Rev G July 2014

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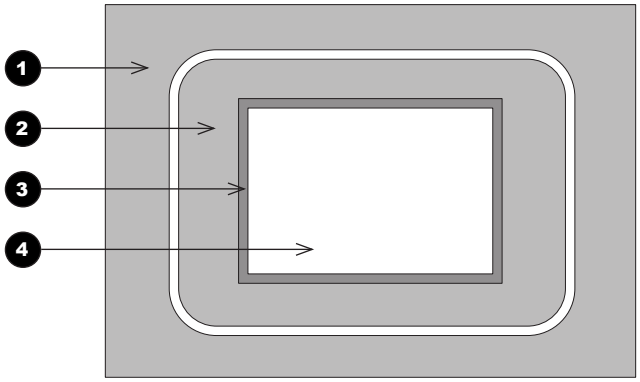
The DMD™

A DMD™ (Digital Micromirror Device™) is a true digital light modulator which utilises an array of up to 2.3 million moving aluminium mirrors, with each one representing a pixel in the final projected image. The outermost micromirrors in the array remain inactive and are not used in constructing the image.

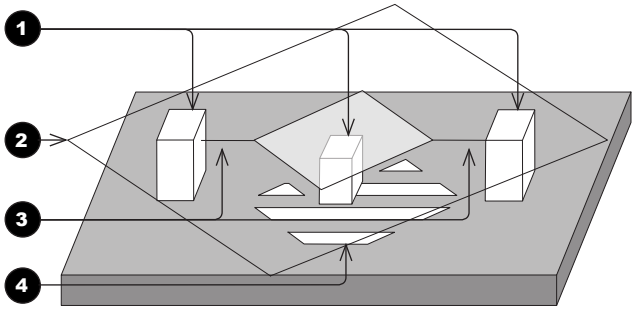
1. **Casing**
2. **Light shield**
3. **Inactive mirrors**
4. **Array**



DMD

Each mirror element is suspended over address electrodes by a torsion hinge between two posts.

1. **Support posts**
2. **Mirror element**
3. **Torsion hinges**
4. **Offset address electrode**



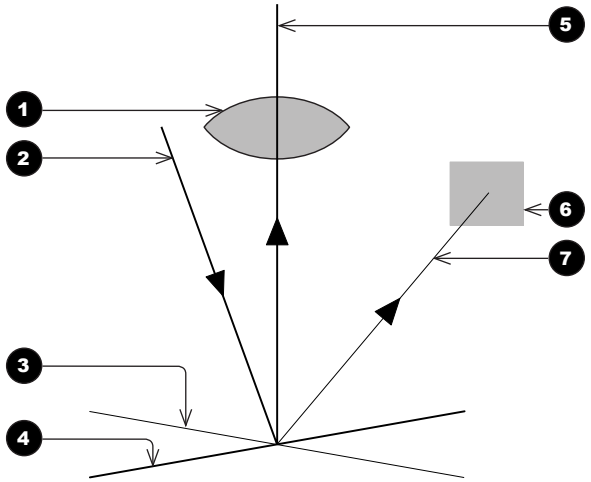
Mirror element with tilt mechanism

Notes

The DMD™ (continued)

Depending on the voltage polarity applied, each mirror will either tilt to the left to produce a bright pixel or to the right for a dark pixel. When light is applied to the complete DMD™, only the light redirected from a mirror tilting to the left is projected.

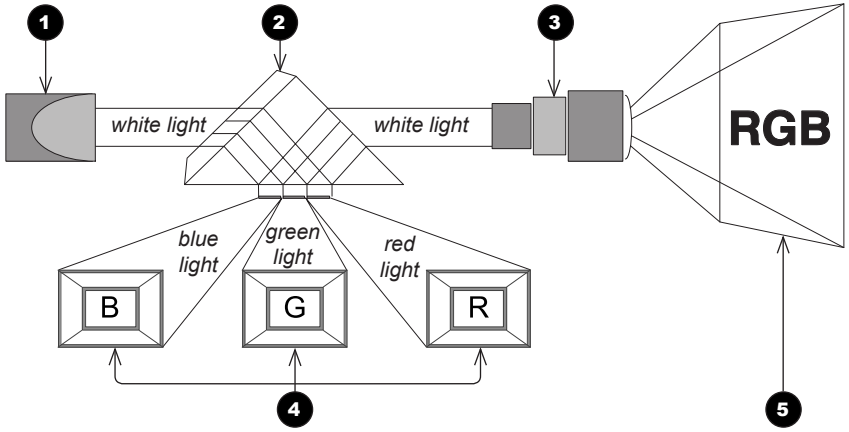
1. **Projection lens**
2. **Incoming light from the lamp**
3. **Mirror element tilted to the right**
4. **Mirror element tilted to the left**
5. **Reflected light, left tilt**
6. **Light dump**
7. **Reflected light, right tilt**



Light flow

The projector optically filters white light from the lamp into its constituent red, green and blue. Each color illuminates a separate DMD™ whose modulated output is then recombined with the other two to form the projected full color image.

1. **Lamp**
2. **Optical filtering of light into red, green and blue**
3. **Projection lens**
4. **DMD™ devices**
5. **Full color image displayed on screen**



Filtering process

Notes

Aspect Ratios Explained

The appearance of a projected image on the screen depends on a combination of the following:

- The DMD™ resolution:
  - **1080p** with a 1920 x 1080 resolution, corresponding to an aspect ratio of 16:9
  - **WUXGA** with a 1920 x 1200 resolution, corresponding to an aspect ratio of 16:10
- The aspect ratio of the input signal: **4:3**, **16:9** or **16:10**
- The value of the **Aspect Ratio** setting of the projector:
  - **Source** - show the image with its original aspect ratio, not using the whole screen if the DMD™ aspect ratio does not match.
  - **Fill Display** - fill the screen but force the DMD™ aspect ratio on the image.
  - **Fill & Crop** - fill the screen without changing the original aspect ratio but cropping the image to fit the DMD™ aspect ratio.
  - **Anamorphic** - force a 16:9 ratio on the source. You need this setting to resolve 16:9 images packed into a 4:3 frame, otherwise it distorts the image.
  - **TheaterScope** is a special setting used in combination with an anamorphic lens, an optional accessory. It removes letterboxing from a 2.35:1 source packed into a 16:9 frame.

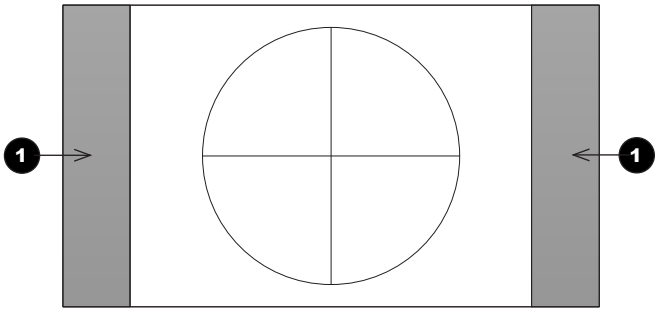
Notes

Aspect ratio examples for DMD™ resolution 1080p

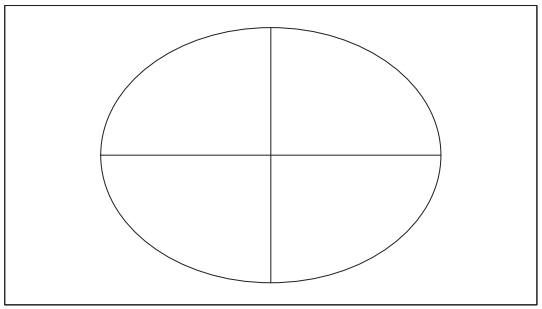
Source: 4:3

1 **Unused screen areas**

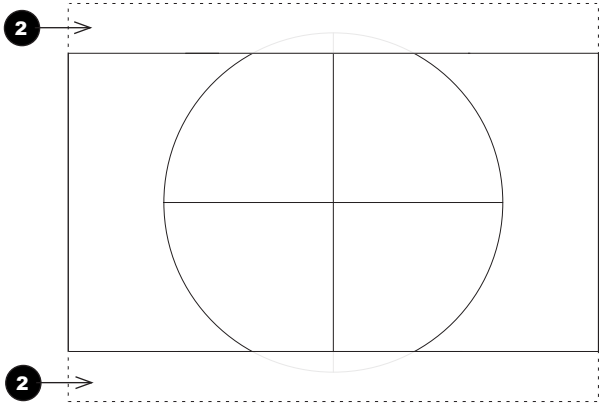
2 **Cropped parts of the image**



Aspect Ratio: Source



Aspect Ratio: Fill Display, Anamorphic

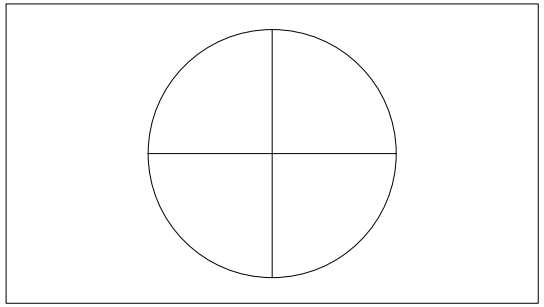


Aspect Ratio: Fill & Crop

Notes

Aspect ratio examples for DMD™ resolution 1080p (continued)

Source: 16:9 (native resolution)



Aspect Ratio: Source / Fill Display / Fill & Crop

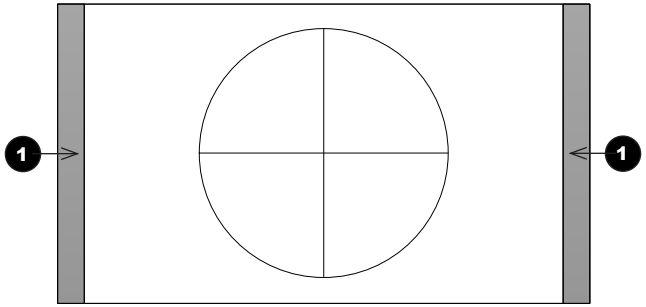
Notes

Aspect ratio examples for DMD™ resolution 1080p (continued)

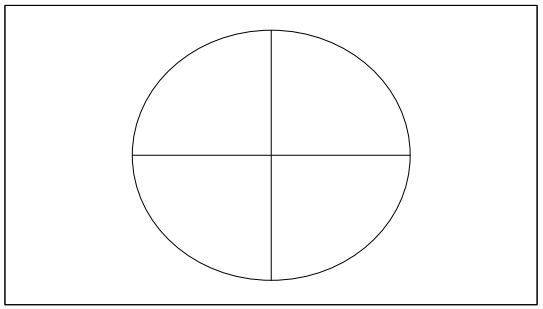
Source: 16:10

1 **Unused screen areas**

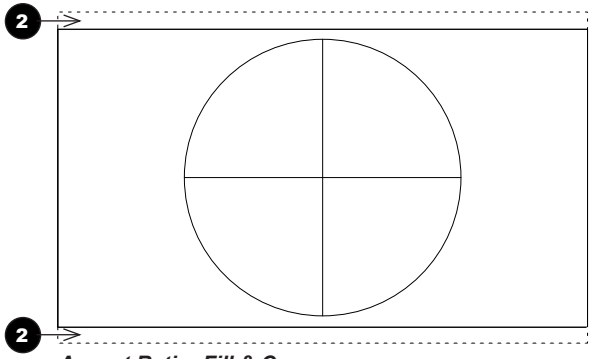
2 **Cropped parts of the image**



Aspect Ratio: Source



Aspect Ratio: Fill Display



Aspect Ratio: Fill & Crop

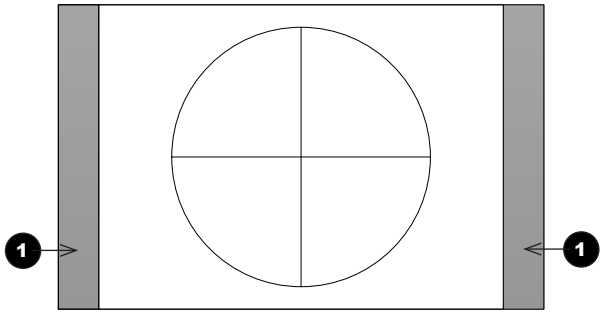
Notes

Aspect ratio examples for DMD™ resolution WUXGA

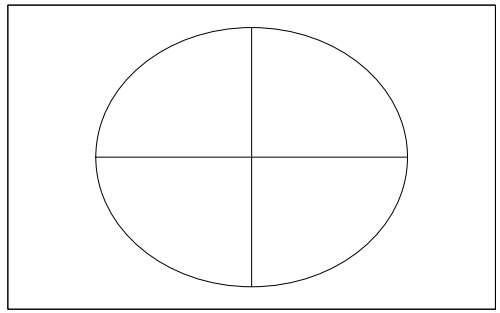
Source: 4:3

1 **Unused screen areas**

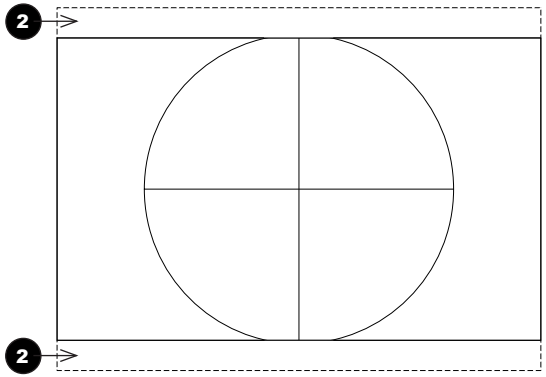
2 **Cropped parts of the image**



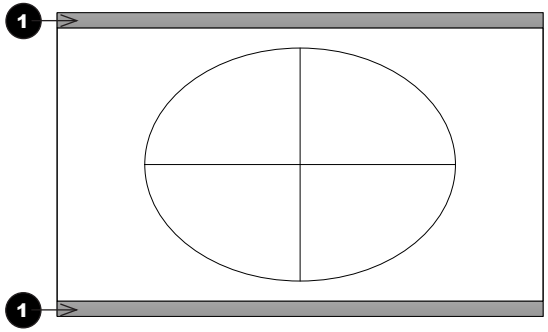
Aspect Ratio: Source



Aspect Ratio: Fill Display



Aspect Ratio: Fill & Crop



Aspect Ratio: Anamorphic

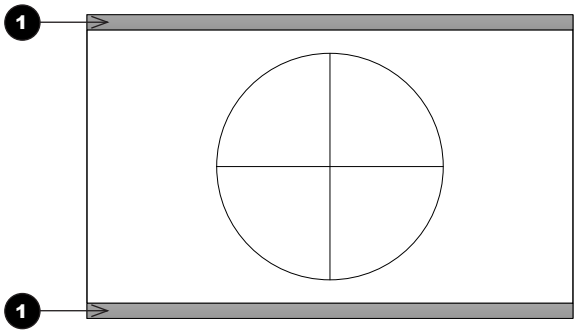
Notes

Aspect ratio examples for DMD™ resolution WUXGA (continued)

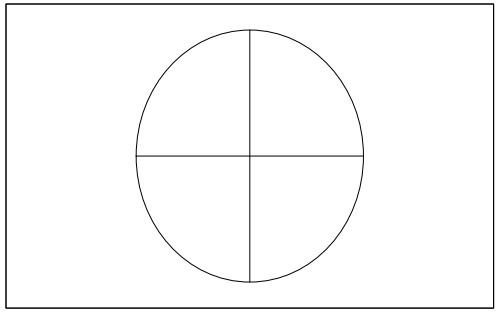
Source: 16:9

1 **Unused screen areas**

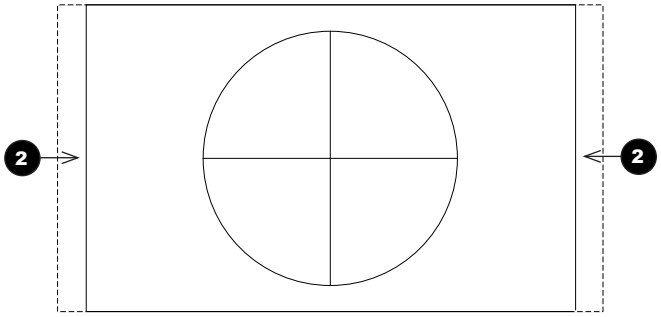
2 **Cropped parts of the image**



Aspect Ratio: Source



Aspect Ratio: Fill Display

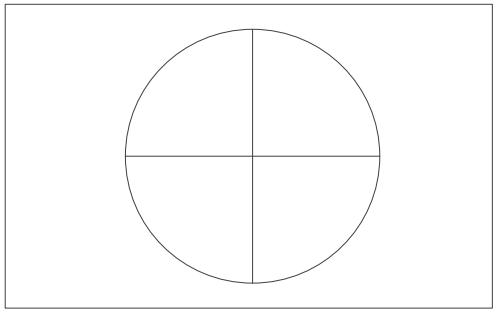


Aspect Ratio: Fill & Crop

Notes

Aspect ratio examples for DMD™ resolution WUXGA (continued)

Source: 16:10 (native resolution)



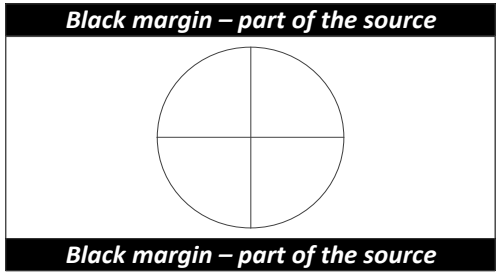
Aspect Ratio: Source / Fill Display / Fill & Crop

Notes

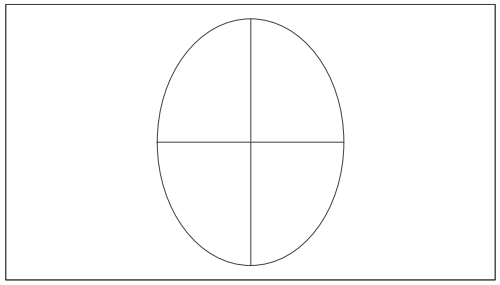
Aspect ratio example: TheaterScope

The **TheaterScope** setting is used in combination with an anamorphic lens to restore 2.35:1 images packed into a 16:9 frame. Such images are projected with black lines at the top and bottom of the 16:9 screen to make up for the difference in aspect ratios.

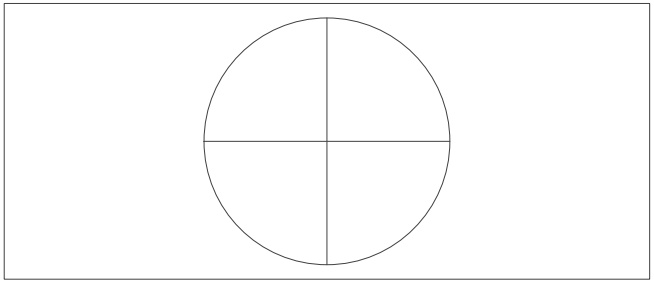
Without an anamorphic lens and without the TheaterScope setting applied, a 16:9 source containing a 2.35:1 image looks like this:



If we change the setting to **TheaterScope**, the black lines will disappear but the image will stretch vertically to reach the top and bottom of the DMD™:



An anamorphic lens will stretch the image horizontally, restoring the original 2.35 ratio:



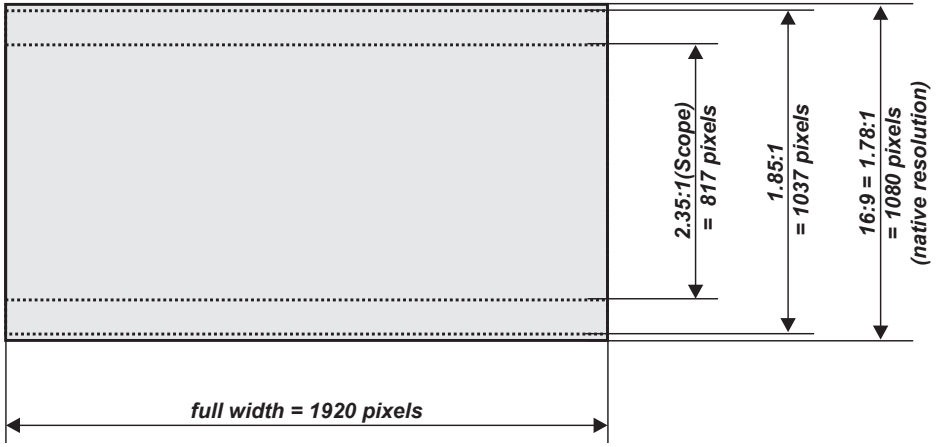
Notes

Screen Requirements

Fitting the image to the DMD™

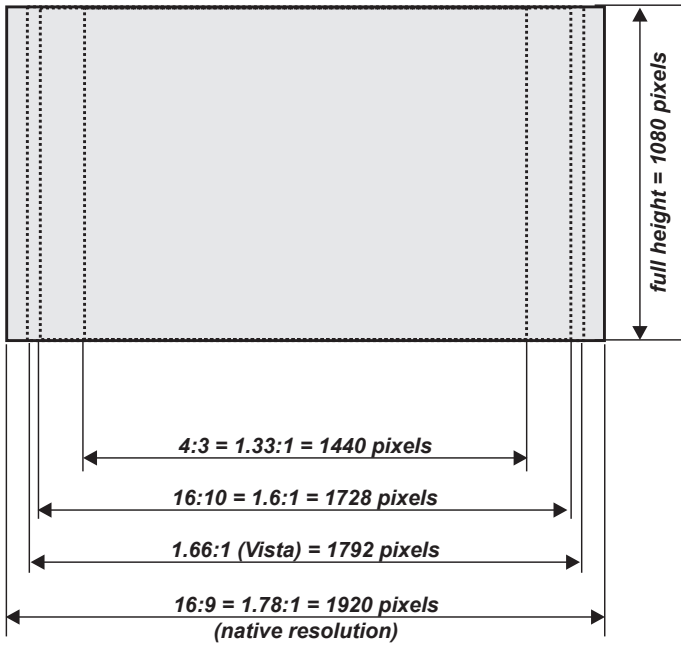
If the source image supplied to the projector is smaller than the DMD™ resolution, the image will not fill the DMD™. The following examples show how a number of common formats may be displayed, depending on your DMD™ resolution.

1080p images displayed full width



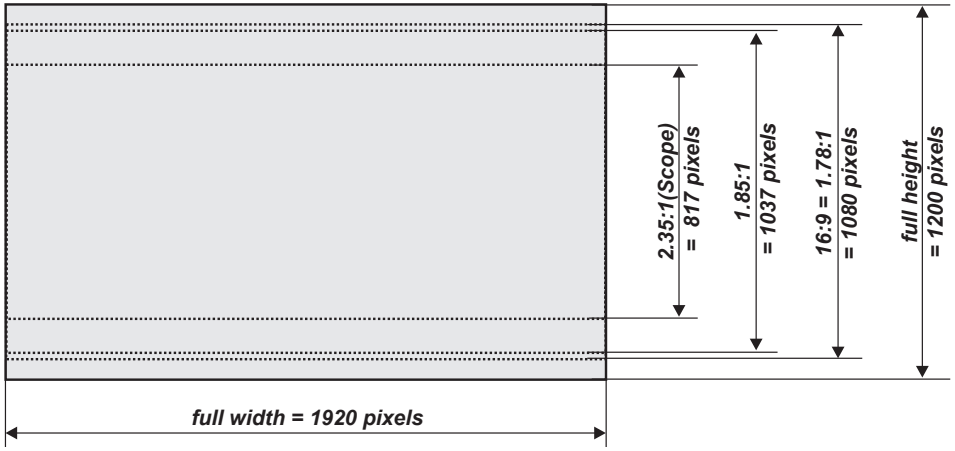
Notes

1080p images displayed full height

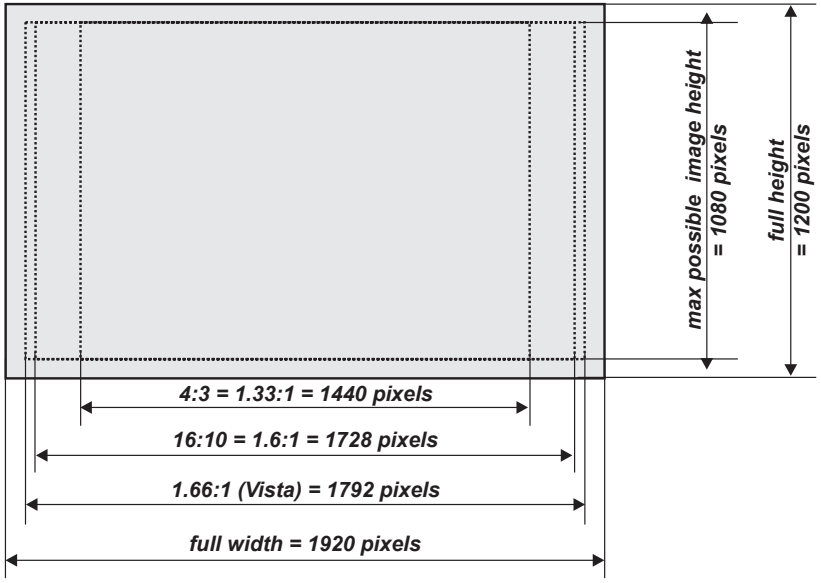

full height = 1080 pixels
4:3 = 1.33:1 = 1440 pixels
16:10 = 1.6:1 = 1728 pixels
1.66:1 (Vista) = 1792 pixels
16:9 = 1.78:1 = 1920 pixels
(native resolution)

Notes

WUXGA images displayed full width

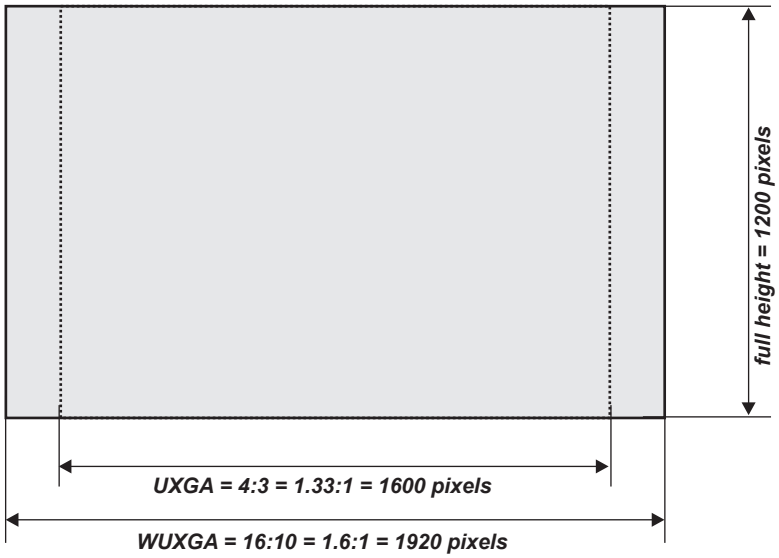


WUXGA images displayed with a height of 1080 pixels


max possible image height
= 1080 pixels
full height
= 1200 pixels
4:3 = 1.33:1 = 1440 pixels
16:10 = 1.6:1 = 1728 pixels
1.66:1 (Vista) = 1792 pixels
full width = 1920 pixels

Notes

WUXGA images displayed full height



Notes

Only WUXGA or UXGA images can fill the full height of the DMD™, using all 1200 pixels without scaling.

Diagonal screen sizes

Screen sizes are sometimes specified by their diagonal size (D). When dealing with large screens and projection distances at different aspect ratios, it is more convenient to measure screen width (W) and height (H).

The example calculations below show how to convert diagonal sizes into width and height, at various aspect ratios.

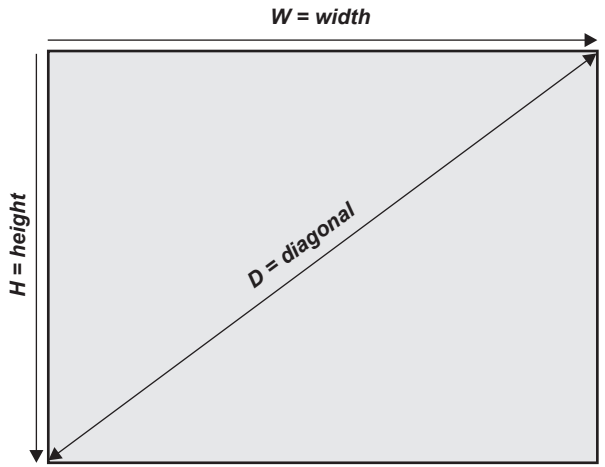
2.35:1 (Scope)
W = D x 0.92 ***H*** = D x 0.39

1.85:1
W = D x 0.88 ***H*** = D x 0.47

16:9 = 1.78:1 (native aspect ratio for 1080p projectors)
W = D x 0.87 ***H*** = D x 0.49

1.66:1 (Vista)
W = D x 0.86 ***H*** = D x 0.52

16:10 = 1.6:1 (native aspect ratio for WUXGA projectors)
W = D x 0.85 ***H*** = D x 0.53



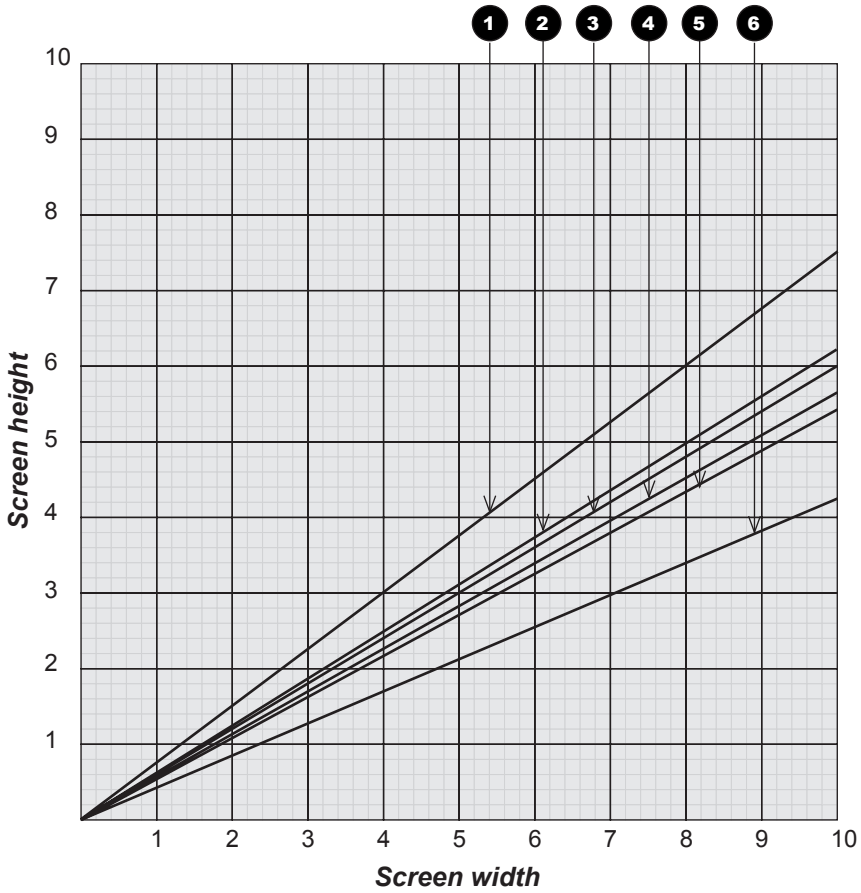
Notes

Fitting the image to the screen

It is important that your screen is of sufficient height and width to display images at all the aspect ratios you are planning to use.

Use the conversion chart to check that you are able to display the full image on your screen. If you have insufficient height or width, you will have to reduce the overall image size in order to display the full image on your screen.

1. **4:3 = 1.33:1**
   W = H x 1.33, H = W x 0.75
2. **16:10 = 1.6:1**
   (native aspect ratio for WUXGA projectors)
   W = H x 1.6, H = W x 0.625
3. **1.66:1 (Vista)**
   W = H x 1.66, H = W x 0.6
4. **16:9 = 1.78:1**
   (native aspect ratio for 1080p projectors)
   W = H x 1.78, H = W x 0.56
5. **1.85:1 (Flat)**
   W = H x 1.85, H = W x 0.54
6. **2.35:1 (Scope)**
   W = H x 2.35, H = W x 0.426

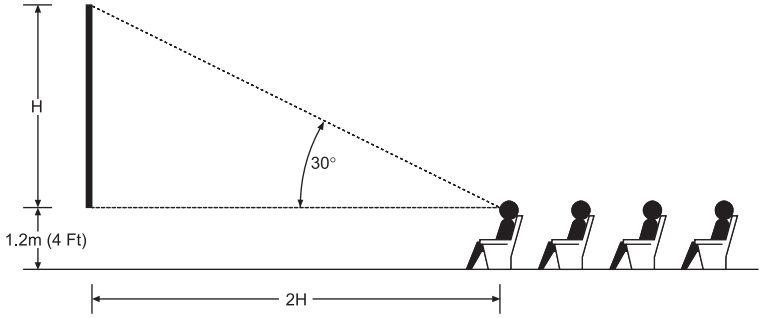


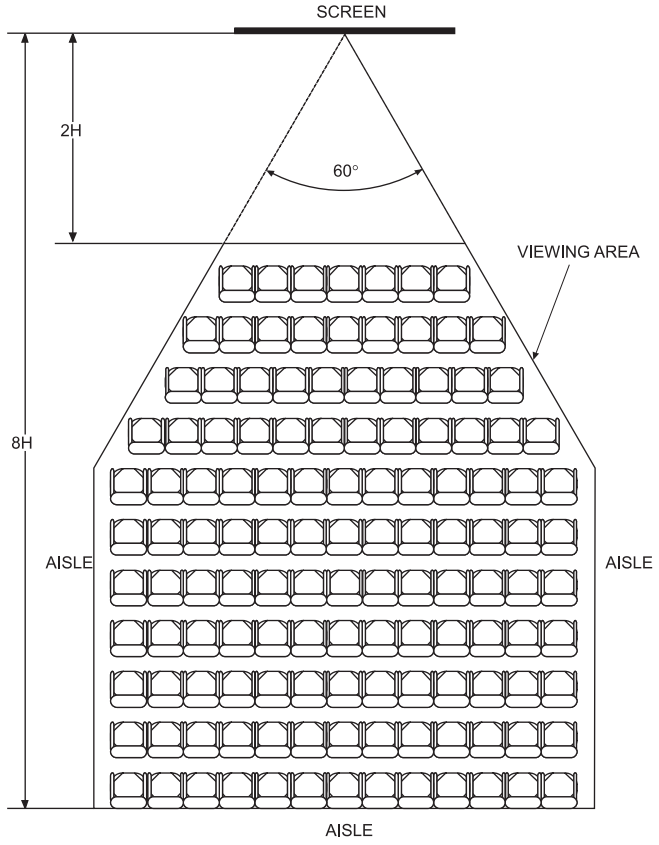
Notes

Positioning the screen and projector

For optimum viewing, the screen should be a flat surface perpendicular to the floor. The bottom of the screen should be 1.2 m (4 ft) above the floor and the front row of the audience should not have to look up more than 30° to see the top of the screen.

The distance between the front row of the audience and the screen should be at least twice the screen height and the distance between the back row and the screen should be a maximum of 8 times the screen height. The screen viewing area should be within a 60° range from the face of the screen.





Notes

The projector should be installed as close to the power outlet as possible.

The power connection should be easily accessible, so that it can be disconnected in an emergency.

Ensure that there is at least 30 cm (12 in.) of space between the ventilation outlets and any wall, and 10 cm (4 in.) on all other sides.

Do not install the projector close to anything that might be affected by its operational heat, for instance, polystyrene ceiling tiles, curtains etc.

*The image can be flipped for rear projection (see **Setup menu** in the **Operating Guide**) and displayed without the need for extra mirrors or equipment.*

However, you must ensure that there is sufficient distance behind the screen for the projector to be correctly located.

Rear installation is generally more complicated and advice should be sought from your local dealer before attempting it.

Choosing A Lens

A number of lenses are available. Which lens you choose depends on the screen size, image aspect ratio, throw distance and light output.

The following table shows all available lenses in order of their ***throw ratios***:

Throw ratios	Throw distance range
0.77 : 1 fixed lens	1.3 - 2.5 m (4.3 - 8.2 ft)
1.16 : 1 fixed lens	1.4 - 6.2 m (4.6 - 20.3 ft)
1.45 - 1.74 : 1 zoom lens	1.8 - 9.3 m (5.9 - 30.5 ft)
1.74 - 2.17 : 1 zoom lens	2.2 - 11.8 m (7.2 - 38.7 ft)
2.17 - 2.90 : 1 zoom lens	2.7 - 15.4 m (8.9 - 50.5 ft)
2.90 - 4.34 : 1 zoom lens	3.6 - 22.5 m (11.8 - 73.8 ft)
4.34 - 6.76 : 1 zoom lens	5.5 - 35 m (18 - 115 ft)

To choose a lens, either calculate the ***throw ratio*** required, or use the ***lens charts*** provided within this section.

Notes

For information about individual lens part numbers, see ***Appendix A*** *at the end of this document.*

Choosing a lens by calculation

Basic calculation

Identify the required lens by calculating the ***throw ratio***.

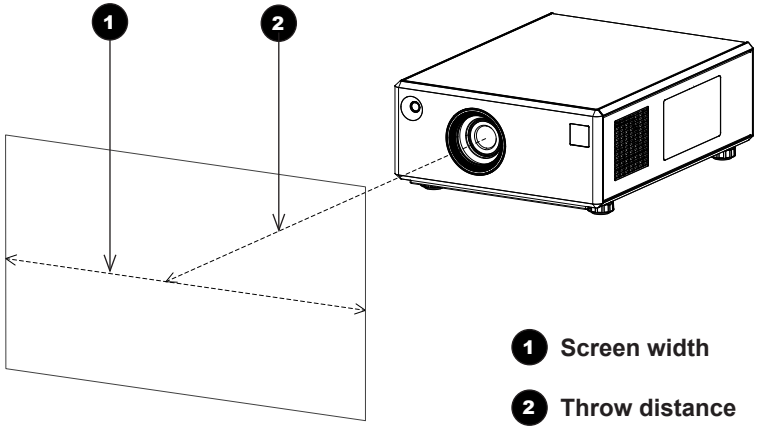
A ***throw ratio*** is the ratio of the throw distance to the screen width:

$$\text{Throw ratio} = \frac{\text{Throw distance}}{\text{Screen width}}$$

1. Use the formula above to obtain the required throw ratio.
2. Match the throw ratio with a lens from the table below:

Throw ratios	Throw distance range
0.77 : 1 fixed lens	1.3 - 2.5 m (4.3 - 8.2 ft)
1.16 : 1 fixed lens	1.4 - 6.2 m (4.6 - 20.3 ft)
1.45 - 1.74 : 1 zoom lens	1.8 - 9.3 m (5.9 - 30.5 ft)
1.74 - 2.17 : 1 zoom lens	2.2 - 11.8 m (7.2 - 38.7 ft)
2.17 - 2.90 : 1 zoom lens	2.7 - 15.4 m (8.9 - 50.5 ft)
2.90 - 4.34 : 1 zoom lens	3.6 - 22.5 m (11.8 - 73.8 ft)
4.34 - 6.76 : 1 zoom lens	5.5 - 35 m (18 - 115 ft)

3. Ensure the required throw distance is within the range covered by the lens.



1 Screen width

2 Throw distance

Notes

The basic calculation on this page does not take into consideration DMD™ and image size, which could affect the throw ratio. For a more complex and realistic calculation, see ***Full lens calculation*** *in this section.*

When calculating the throw ratio, be sure to use identical measurement units for both the throw distance and the screen width.

For information about individual lens part numbers, see ***Appendix A*** *at the end of this document.*

Basic calculation example

1. **Calculate the throw ratio using the formula.**

   Your screen is ***4.5m*** wide and you wish to place the projector approximately ***11m*** from the screen. The throw ratio will then be

   $$\frac{11}{4.5} = \mathbf{2.44}$$

2. **Match the result with the lens table.**

   The lens matching a throw ratio of 2.44 is ***the 2.17 - 2.90 : 1 zoom lens***.

3. **Check whether the lens covers the required throw distance.**

   The range quoted for the 2.17 - 2.90 : 1 zoom lens is ***2.7 - 15.4m***. The required distance of 11m is within the range.

INFORMATION YOU NEED FOR THIS CALCULATION

- The throw ratio formula:

$$\textit{Throw ratio} = \frac{\textit{Throw distance}}{\textit{Screen width}}$$

- The lens table:

Throw ratios	Throw distance range
0.77 : 1 fixed lens	1.3 - 2.5 m (4.3 - 8.2 ft)
1.16 : 1 fixed lens	1.4 - 6.2 m (4.6 - 20.3 ft)
1.45 - 1.74 : 1 zoom lens	1.8 - 9.3 m (5.9 - 30.5 ft)
1.74 - 2.17 : 1 zoom lens	2.2 - 11.8 m (7.2 - 38.7 ft)
2.17 - 2.90 : 1 zoom lens	2.7 - 15.4 m (8.9 - 50.5 ft)
2.90 - 4.34 : 1 zoom lens	3.6 - 22.5 m (11.8 - 73.8 ft)
4.34 - 6.76 : 1 zoom lens	5.5 - 35 m (18 - 115 ft)

Notes

The basic calculation on this page does not take into consideration DMD™ and image size, which could affect the throw ratio. For a more complex and realistic calculation, see ***Full lens calculation*** *in this section.*

For information about individual lens part numbers, see ***Appendix A*** *at the end of this document.*

Full lens calculation

Introducing TRC

The choice of lens will affect the image size and will address discrepancies between the DMD™ resolution and the source.

When an image fills the height of the DMD™ but not the width, it uses less than 100% of the DMD™ surface. A lens chosen using the basic formula may produce an image that is considerably smaller than the actual screen.

To compensate for loss of screen space in such situations, you need to increase the throw ratio using a ***Throw Ratio Correction (TRC)***.

Example

Fig. 1 illustrates a 4:3 image within a 1080p DMD™.

When a 1080p projector is used for a 4:3 image, the image does not fill the width of the DMD™, creating a ***pillarboxing*** effect - blank spaces to the left and right.

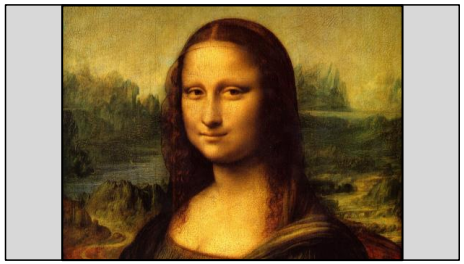


Fig. 1

Fig. 2 shows the same image projected on a 4:3 screen using a standard lens (chosen with the basic calculation).

The DMD™ accurately fills the width of the screen; however, the pillarboxing is now part of the projected image and is transferred to the screen.

The DMD™ does not fill the height of the screen, which has caused ***letterboxing*** - further blank spaces at the top and bottom of the screen.

The image is now surrounded by blank space, which can be removed if the throw ratio is increased.

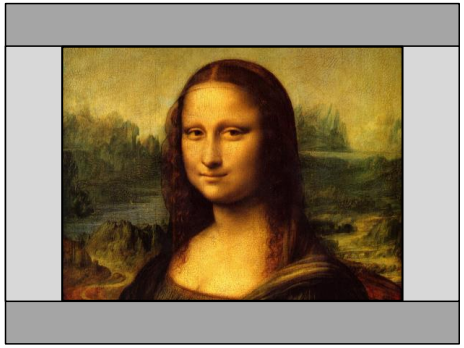


Fig. 2

Fig. 3 shows the image projected on the same screen with a lens chosen using TRC.

The increased throw ratio has allowed the 4:3 image to fill the 4:3 screen seamlessly.

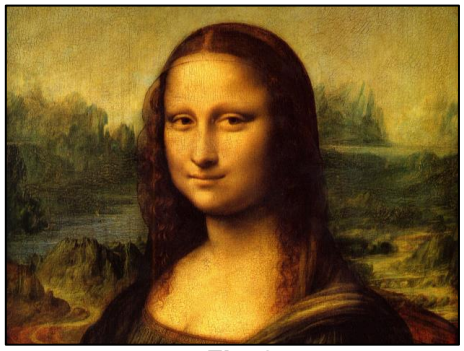


Fig. 3

Notes

TRC can only be applied if greater than 1. If TRC is 1 or less, disregard it and calculate the throw ratio using the basic formula.

Calculating TRC

To calculate TRC, use the following formula:

$$TRC = \frac{DMD™ \text{ aspect ratio}}{\text{Source aspect ratio}}$$

TRC table

Alternatively, you can save time by referencing the following table, which shows the TRC value for some popular image formats:

	HIGHlite 660 1080p	*HIGHlite 660 WUXGA*
2.35:1 (Scope), 1920 x 817 pixels	TRC < 1, not used	TRC < 1, not used
1.85:1 (Flat), 1920 x 1037 pixels	TRC < 1, not used	TRC < 1, not used
1.78:1 (16:9), 1920 x 1080	TRC = 1, not used (native resolution)	TRC < 1, not used
1.66:1 (Vista), 1792 x 1080 pixels	TRC = 1.07	TRC < 1, not used
1.6:1 (16:10), 1728 x 1080 pixels	TRC = 1.11	TRC = 1, not used (native resolution)
1.33:1 (4:3), 1440 x 1080 pixels	TRC = 1.33	TRC = 1.2
1.25:1 (5:4), 1350 x 1080 pixels	TRC = 1.42	TRC = 1.28

Notes

TRC can only be applied if greater than 1. If TRC is 1 or less, disregard it and calculate the throw ratio using the basic formula.

Calculating the throw ratio with TRC

1. For TRC > 1, amend the basic throw ratio formula as follows:

$$\textit{Throw ratio} = \frac{\textit{Throw distance}}{\textit{Screen width } \boldsymbol{x\ TRC}}$$

2. Once a throw ratio is established, identify the matching lens from the table:

Throw ratios	Throw distance range
0.77 : 1 fixed lens	1.3 - 2.5 m (4.3 - 8.2 ft)
1.16 : 1 fixed lens	1.4 - 6.2 m (4.6 - 20.3 ft)
1.45 - 1.74 : 1 zoom lens	1.8 - 9.3 m (5.9 - 30.5 ft)
1.74 - 2.17 : 1 zoom lens	2.2 - 11.8 m (7.2 - 38.7 ft)
2.17 - 2.90 : 1 zoom lens	2.7 - 15.4 m (8.9 - 50.5 ft)
2.90 - 4.34 : 1 zoom lens	3.6 - 22.5 m (11.8 - 73.8 ft)
4.34 - 6.76 : 1 zoom lens	5.5 - 35 m (18 - 115 ft)

3. Ensure the required throw distance is within the range of the matching lens.

Notes

TRC can only be applied if greater than 1. If TRC is 1 or less, disregard it and calculate the throw ratio using the basic formula.

Full lens calculation example

Your screen is ***4.5m*** wide; you wish to place the projector approximately ***11m*** from the screen. You use a ***WUXGA*** projector; the source is ***4:3***.

1. Calculate TRC as follows:

$$TRC = \frac{1.6}{1.33} = 1.2$$

2. Calculate the throw ratio:

$$Throw\ ratio = \frac{11}{4.5 \times 1.2} = 2.04$$

3. Find a match in the lens table.

   The table shows that the matching lens is ***the 1.74 - 2.17 : 1 zoom lens***.

4. Check whether the lens covers the required throw distance.

   The range quoted for the 1.74 - 2.17 : 1 zoom lens is ***2.2 - 11.8m***. The required distance of 11m is within the range.

INFORMATION YOU NEED FOR THESE CALCULATIONS

- The TRC formula $TRC = \frac{DMD™\ aspect\ ratio}{Source\ aspect\ ratio}$

- The TRC table (to use instead of the formula)

	HIGHlite 660 WUXGA
2.35:1 (Scope)	TRC not used
1.85:1 (Flat)	TRC not used
1.78:1 (16:9)	TRC not used
1.66:1 (Vista)	TRC not used
1.6:1 (16:10)	TRC not used (native resolution)
1.33:1 (4:3)	TRC = 1.2
1.25:1 (5:4)	TRC = 1.28

- The throw ratio formula $Throw\ ratio = \frac{Throw\ distance}{Screen\ width \times TRC}$

- The lens table:

Throw ratios	Throw distance range
0.77 : 1 fixed lens	1.3 - 2.5 m (4.3 - 8.2 ft)
1.16 : 1 fixed lens	1.4 - 6.2 m (4.6 - 20.3 ft)
1.45 - 1.74 : 1 zoom lens	1.8 - 9.3 m (5.9 - 30.5 ft)
1.74 - 2.17 : 1 zoom lens	2.2 - 11.8 m (7.2 - 38.7 ft)
2.17 - 2.90 : 1 zoom lens	2.7 - 15.4 m (8.9 - 50.5 ft)
2.90 - 4.34 : 1 zoom lens	3.6 - 22.5 m (11.8 - 73.8 ft)
4.34 - 6.76 : 1 zoom lens	5.5 - 35 m (18 - 115 ft)

Notes

Lens charts

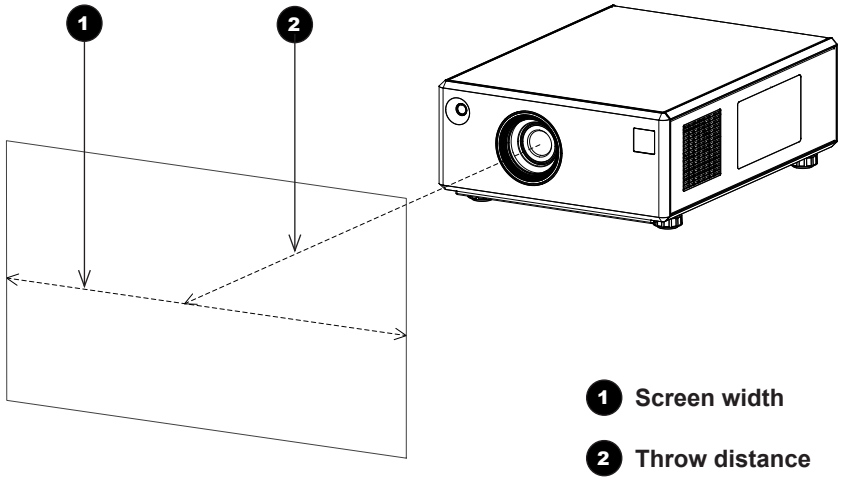
How to use the lens charts

The lens charts on the following pages provide a quick guide to the type of lens needed for a particular projector.

To use the lens charts, you need the following information:

- The DMD™ resolution of your projector
- The distance between the projector and the screen (throw distance)
- The maximum width of your screen

In the chart for the required DMD™ resolution, find the point where the throw distance corresponds to the screen width, as shown in the example below.



1 **Screen width**

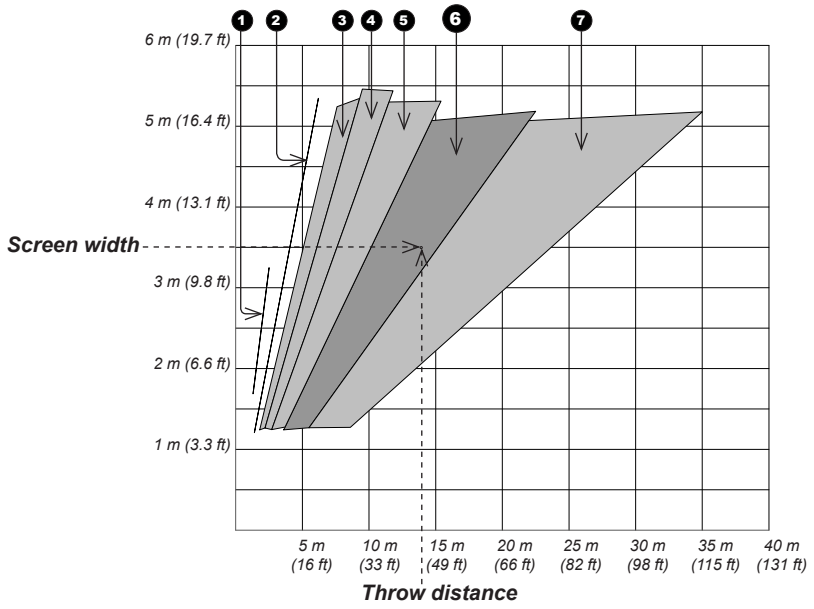
2 **Throw distance**

Example

For a 1080p projector with

- throw distance 14 m, and
- screen width 3.5 m,

the correct lens would be number 6 in the chart.



Notes

*For information about individual lens part numbers, see **Appendix A** at the end of this document.*

How to find the right lens chart

Charts are shown in order of DMD resolution, as follows:

- 1080p
- WUXGA

For each resolution, the available lenses are shown in different charts depending on applicable ***throw ratio corrections*** (TRC).

For each resolution, lens charts are arranged in ascending TRC order, starting from full width images, where TRC=1.

Full width images are grouped together. 1080p and WUXGA are shown in the same chart.

1080p (1920 x 1080 pixels)

Full width images

Formats that fit the width of the DMD™ without applying a throw ratio correction (TRC) include:

- **2.35:1 (Scope)** 1920 x 817 pixels TRC = 1
- **1.85:1 (Flat)** 1920 x 1037 pixels TRC = 1
- **1.78:1 (16:9)** 1920 x 1080 pixels (native resolution) TRC = 1

Full height images

A throw ratio correction (TRC) has been applied to the following charts:

- **1.25:1 (5:4)** 1350 x 1080 pixels TRC = 1.42
- **1.33:1 (4:3)** 1440 x 1080 pixels TRC = 1.33
- **1.6:1 (16:10)** 1728 x 1080 pixels TRC = 1.11
- **1.66:1 (Vista)** 1792 x 1080 pixels TRC = 1.07

Notes

For information about individual lens part numbers, see ***Appendix A*** *at the end of this document.*

WUXGA (1920 x 1200 pixels)

Full width images

Formats that fit the width of the DMD™ without applying a throw ratio correction (TRC) include:

- **2.35:1 (Scope)** 1920 x 817 pixels TRC = 1
- **1.85:1 (Flat)** 1920 x 1037 pixels TRC = 1
- **1.78:1 (16:9)** 1920 x 1080 pixels TRC = 1
- **1.66:1 (Vista)** 1920 x 1156 pixels TRC = 1
- **1.6:1 (16:10)** 1920 x 1200 pixels (native resolution) TRC = 1

Full height images

A throw ratio correction (TRC) has been applied to the following charts:

- **1.25:1 (5:4)** 1500 x 1200 pixels TRC = 1.28
- **1.33:1 (4:3)** 1600 x 1200 pixels TRC = 1.2

Notes

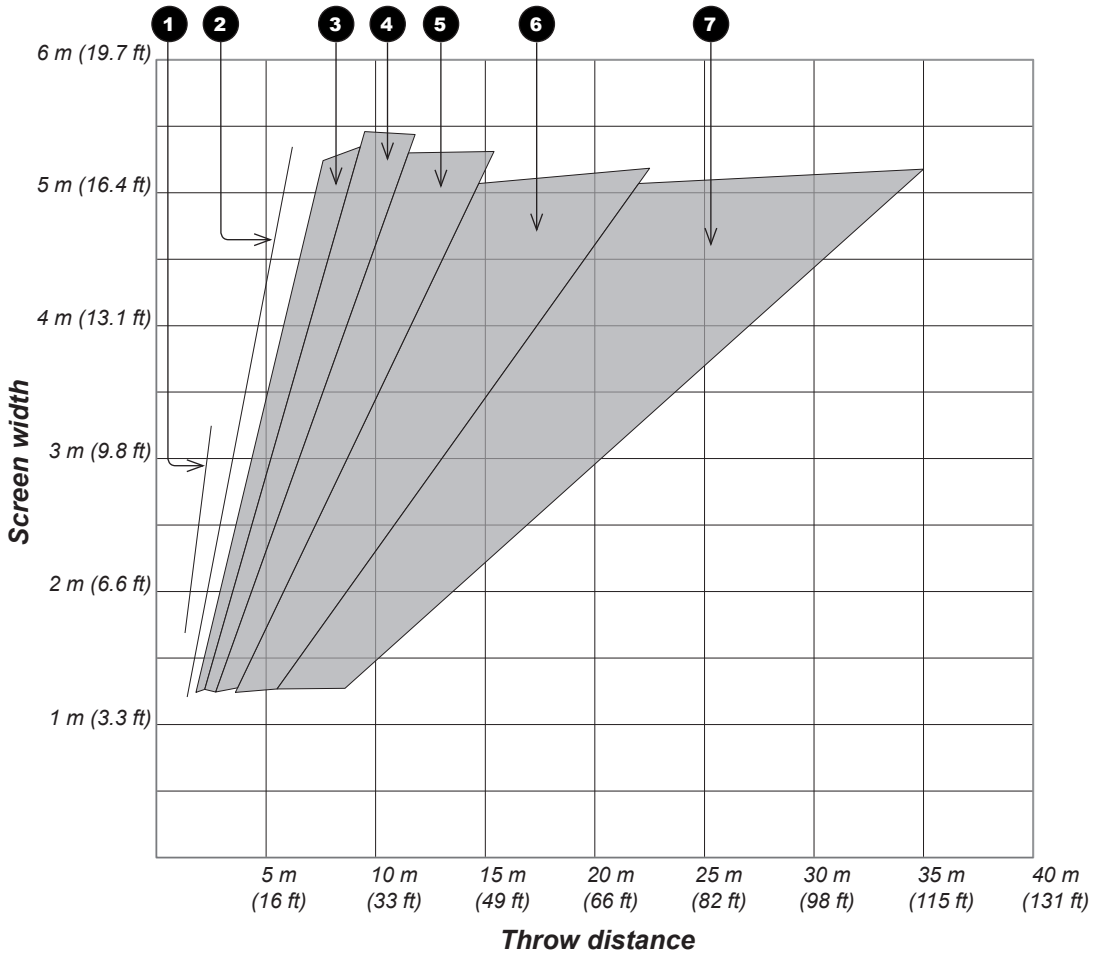
*For information about individual lens part numbers, see **Appendix A** at the end of this document.*

DMD™ resolution 1080p / WUXGA, full DMD™ width images

For 1080p, full width images are 2.35:1 (Scope), 1.85:1 (Flat) 1.78:1 (native).

For WUXGA, full width images are all of the above, plus 1.66:1 (Vista) and 1.6:1 (native).

1. **0.77 : 1 fixed lens**
2. **1.16 : 1 fixed lens**
3. **1.45 - 1.74 : 1 zoom lens**
4. **1.74 - 2.17 : 1 zoom lens**
5. **2.17 - 2.90 : 1 zoom lens**
6. **2.90 - 4.34 : 1 zoom lens**
7. **4.34 - 6.76 : 1 zoom lens**



Notes

This chart has a TRC of 1.0, for use with the following images:

For WUXGA:

2.35:1 (Scope), 1.85:1 (Flat), 1.78:1 (16:9), 1.66:1 (Vista) and 1.6:1 (native)

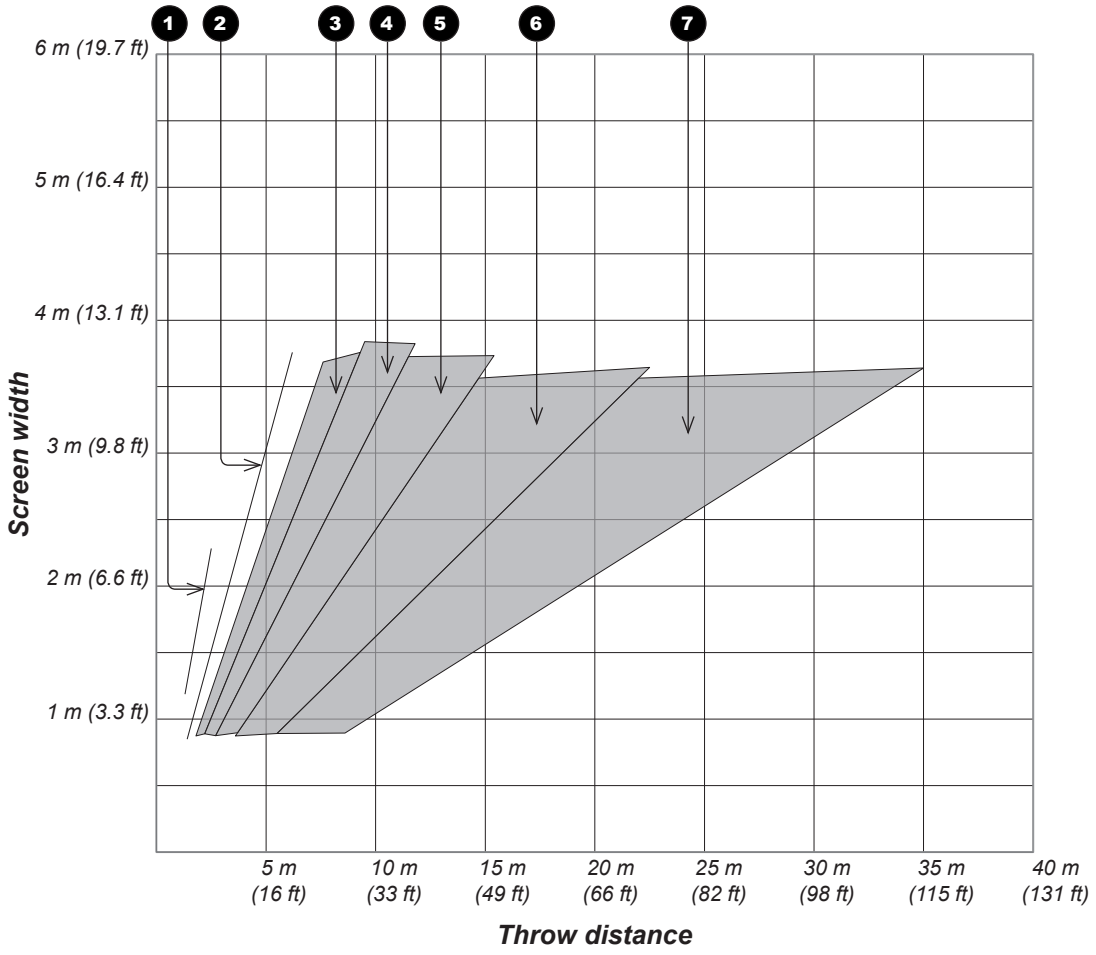
For 1080p:

2.35:1 (Scope), 1.85:1 (Flat) and 1.78:1 (native)

For information about individual lens part numbers, see ***Appendix A*** *at the end of this document.*

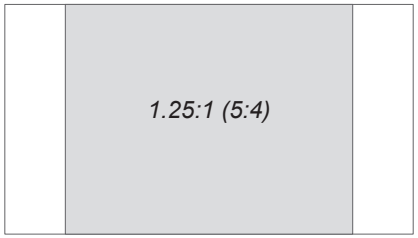
DMD™ resolution 1080p, 1.25:1 images

1. **0.77 : 1 fixed lens**
2. **1.16 : 1 fixed lens**
3. **1.45 - 1.74 : 1 zoom lens**
4. **1.74 - 2.17 : 1 zoom lens**
5. **2.17 - 2.90 : 1 zoom lens**
6. **2.90 - 4.34 : 1 zoom lens**
7. **4.34 - 6.76 : 1 zoom lens**



Notes

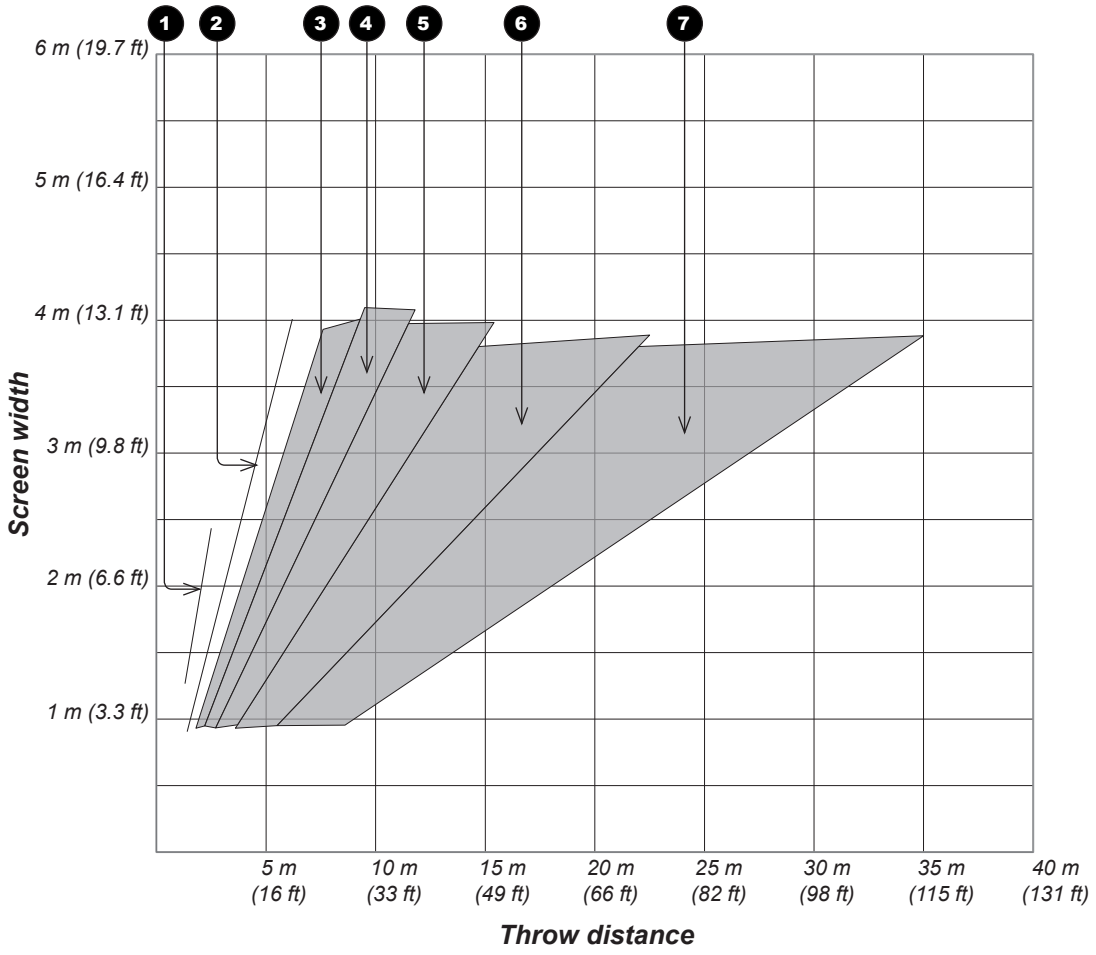
This chart has a TRC of 1.42, for use with the following images:



*For information about individual lens part numbers, see **Appendix A** at the end of this document.*

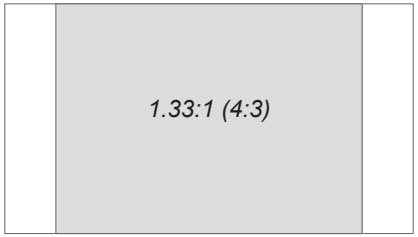
DMD™ resolution 1080p, 1.33:1 images

1. **0.77 : 1 fixed lens**
2. **1.16 : 1 fixed lens**
3. **1.45 - 1.74 : 1 zoom lens**
4. **1.74 - 2.17 : 1 zoom lens**
5. **2.17 - 2.90 : 1 zoom lens**
6. **2.90 - 4.34 : 1 zoom lens**
7. **4.34 - 6.76 : 1 zoom lens**



Notes

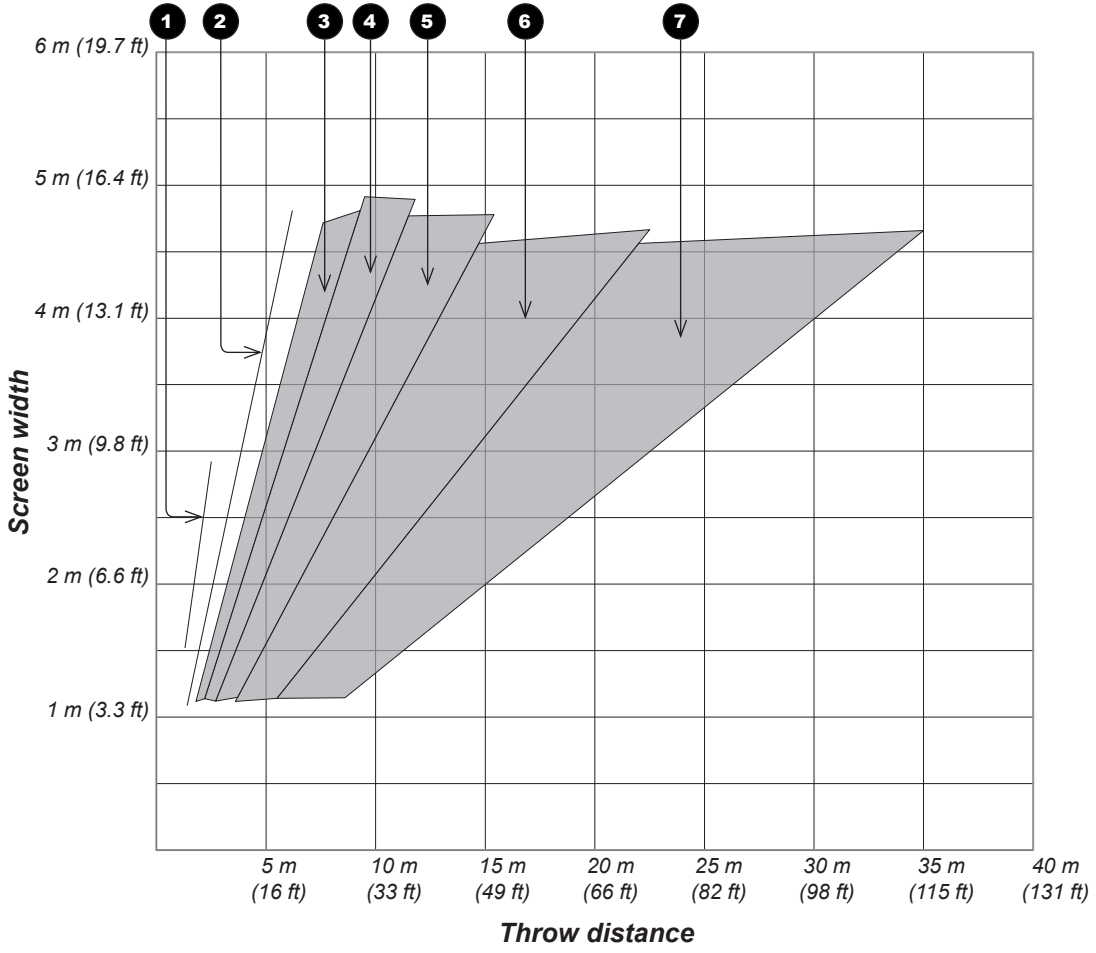
This chart has a TRC of 1.33, for use with the following images:



*For information about individual lens part numbers, see **Appendix A** at the end of this document.*

DMD™ resolution 1080p, 1.6:1 images

1. **0.77 : 1 fixed lens**
2. **1.16 : 1 fixed lens**
3. **1.45 - 1.74 : 1 zoom lens**
4. **1.74 - 2.17 : 1 zoom lens**
5. **2.17 - 2.90 : 1 zoom lens**
6. **2.90 - 4.34 : 1 zoom lens**
7. **4.34 - 6.76 : 1 zoom lens**



Notes

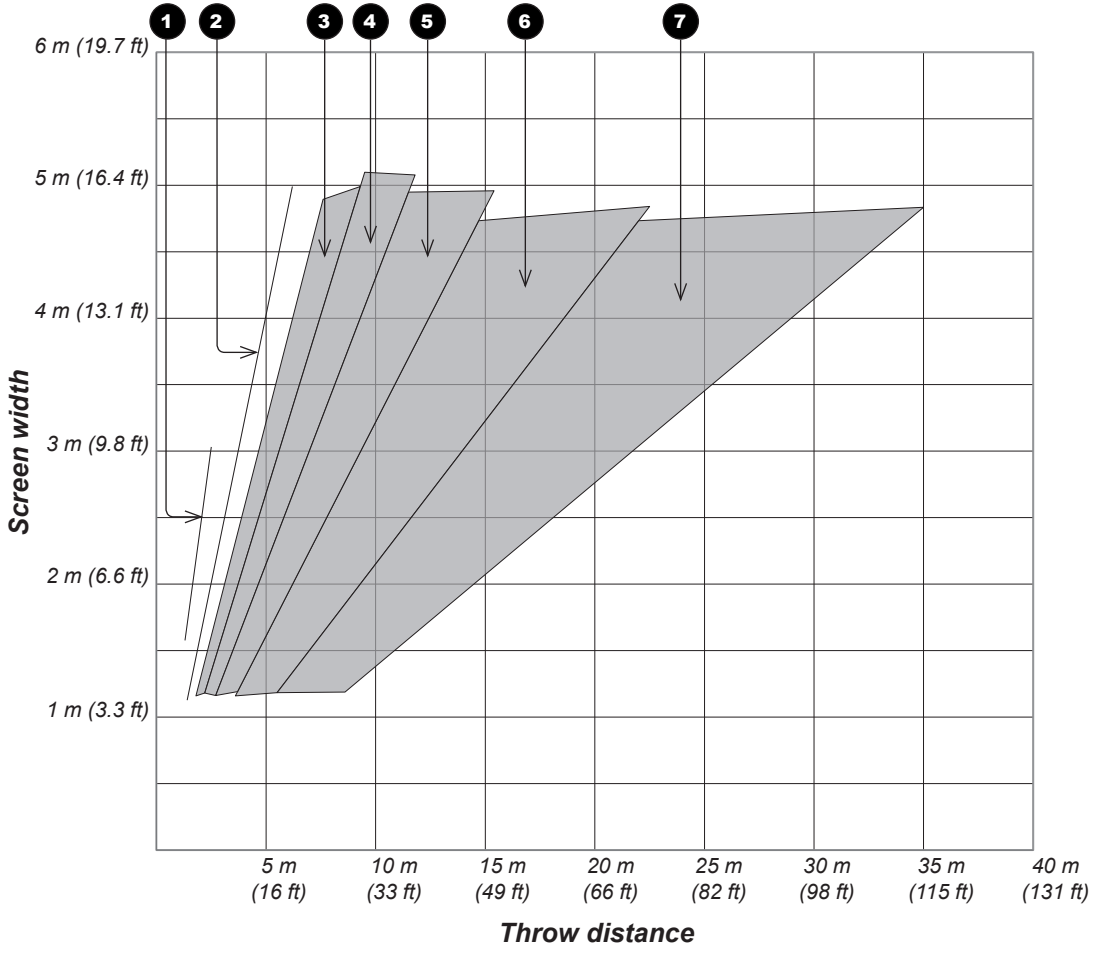
This chart has a TRC of 1.11, for use with the following images:

1.6:1 (16:10)

*For information about individual lens part numbers, see **Appendix A** at the end of this document.*

DMD™ resolution 1080p, 1.66:1 images

1. **0.77 : 1 fixed lens**
2. **1.16 : 1 fixed lens**
3. **1.45 - 1.74 : 1 zoom lens**
4. **1.74 - 2.17 : 1 zoom lens**
5. **2.17 - 2.90 : 1 zoom lens**
6. **2.90 - 4.34 : 1 zoom lens**
7. **4.34 - 6.76 : 1 zoom lens**



Notes

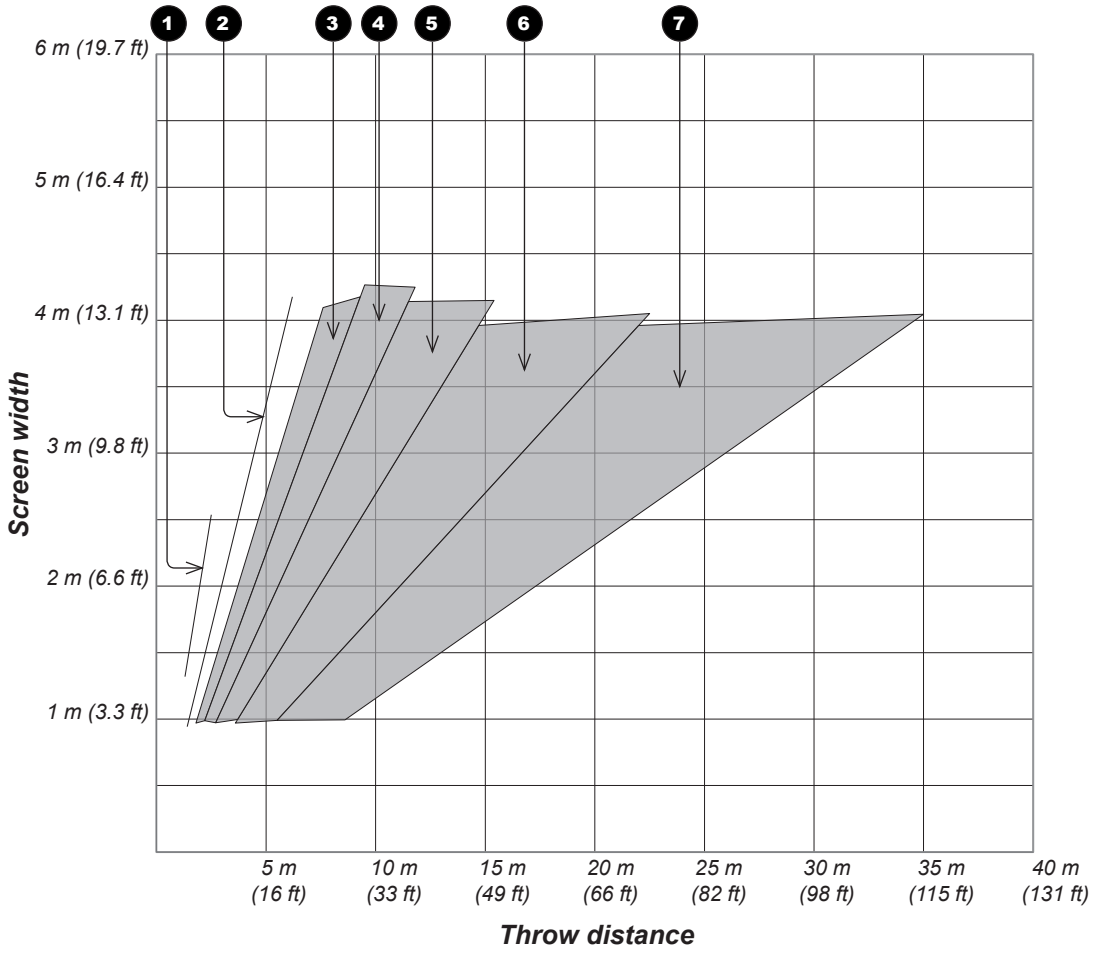
This chart has a TRC of 1.07, for use with the following images:

1.66:1 (Vista)

*For information about individual lens part numbers, see **Appendix A** at the end of this document.*

DMD™ resolution WUXGA, 1.25:1 images

1. **0.77 : 1 fixed lens**
2. **1.16 : 1 fixed lens**
3. **1.45 - 1.74 : 1 zoom lens**
4. **1.74 - 2.17 : 1 zoom lens**
5. **2.17 - 2.90 : 1 zoom lens**
6. **2.90 - 4.34 : 1 zoom lens**
7. **4.34 - 6.76 : 1 zoom lens**



Notes

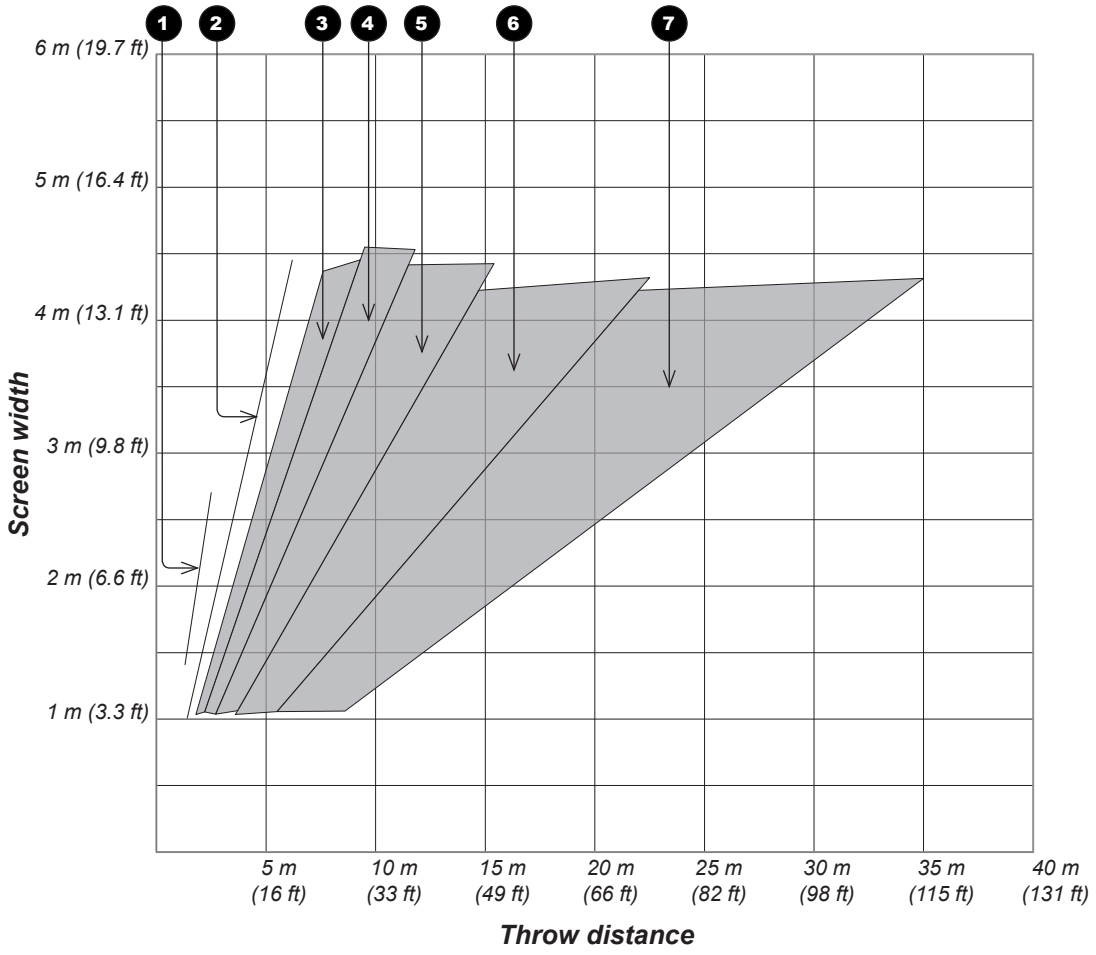
This chart has a TRC of 1.28, for use with the following images:

1.25:1 (5:4)

*For information about individual lens part numbers, see **Appendix A** at the end of this document.*

DMD™ resolution WUXGA, 1.33:1 images

1. **0.77 : 1 fixed lens**
2. **1.16 : 1 fixed lens**
3. **1.45 - 1.74 : 1 zoom lens**
4. **1.74 - 2.17 : 1 zoom lens**
5. **2.17 - 2.90 : 1 zoom lens**
6. **2.90 - 4.34 : 1 zoom lens**
7. **4.34 - 6.76 : 1 zoom lens**



Notes

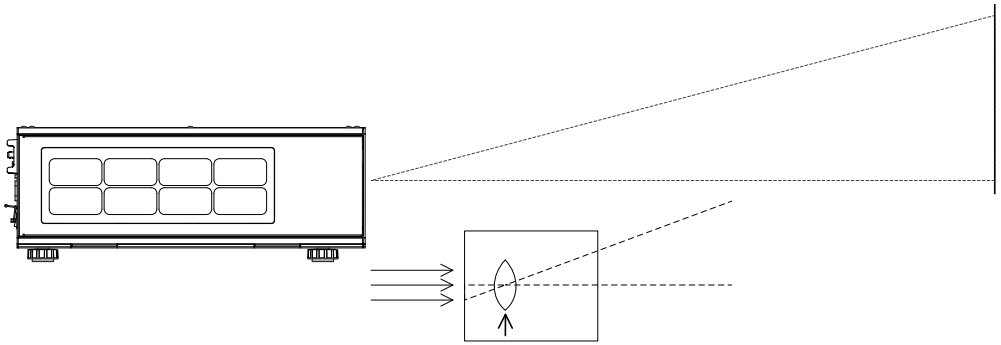
This chart has a TRC of 1.2, for use with the following images:

1.33:1 (4:3)

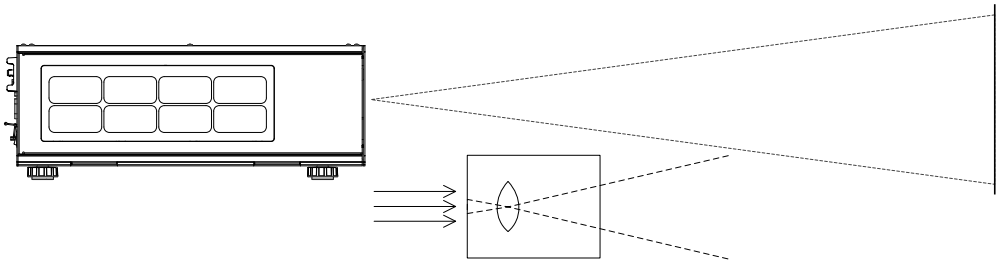
*For information about individual lens part numbers, see **Appendix A** at the end of this document.*

Positioning The Image

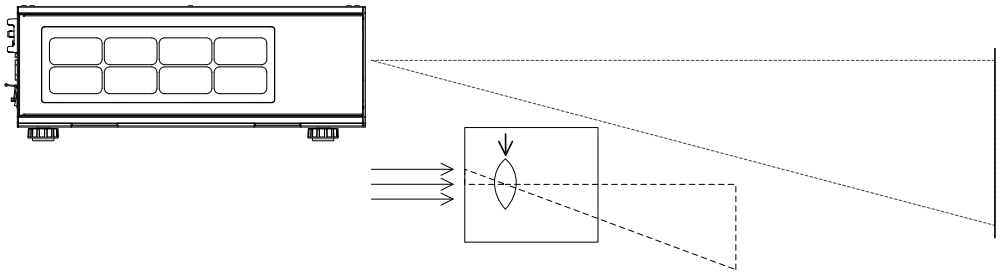
The normal position for the projector is at the centre of the screen. However, you can set the projector above or below the centre, or to one side, and adjust the image using the **Lens shift** feature (known as ***rising and falling front***) to maintain a geometrically correct image.



Shifting the lens up (rising front)



Centered lens



Shifting the lens down (falling front)

Notes

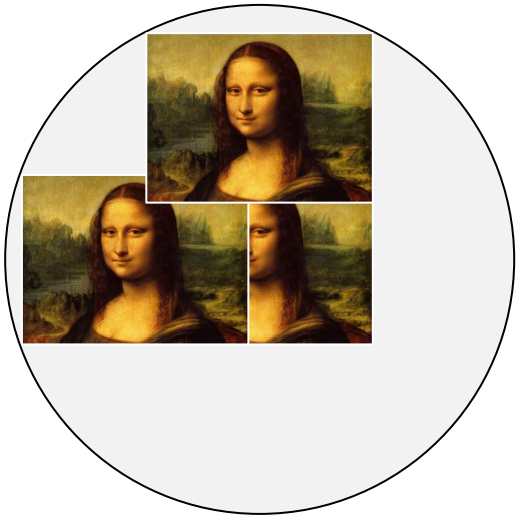
*For more information on shifting the lens, see **Lens menu** in the **Operating Guide**.*

Whenever possible, position the projector so that the lens is centered for the highest quality image.

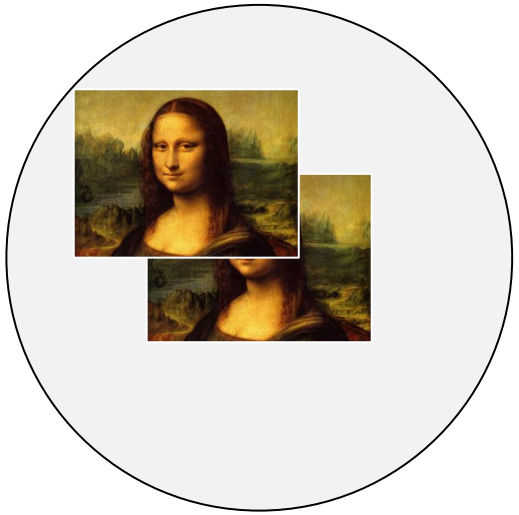
Positioning The Image (continued)

Any single adjustment outside the ranges specified on the following page may result in an unacceptable level of distortion, particularly at the corners of the image, due to the image passing through the periphery of the lens optics.

If the lens is to be shifted in two directions combined, the maximum range without distortion will be somewhat less, as can be seen in the illustrations below.



Full horizontal or vertical shift



Combined shift is reduced

Notes

*For more information on shifting the lens, see **Lens menu** in the **Operating Guide**.*

Maximum offset range

The maximum offset range available with no distortion or vignetting is dependent on which lens is used. Shifting the lens beyond its undistorted limits may be physically possible, however you may experience some vignetting or distortion.

HIGHlite 660 WUXGA	**vertical (pixels)**	**horizontal (pixels)**	**vertical (frame)**	**horizontal (frame)**
0.77 : 1 and 1.16:1 fixed lens	±240	±96	±0.2	±0.05
all zoom lens	±720	±288	±0.6	±0.15

HIGHlite 660 1080p	**vertical (pixels)**	**horizontal (pixels)**	**vertical (frames)**	**horizontal (frames)**
0.77 : 1 fixed lens	±216	±96	±0.375	±0.05
1.16:1 fixed lens	±216	±96	±0.2	±0.05
all zoom lens	±648	±288	±0.6	±0.15

Notes

*For more information on shifting the lens, see **Lens menu** in the **Operating Guide**.*

Input Connections

To get the best possible image from a source it is important to use the highest quality connection. The following lists show the inputs sorted by highest quality connection first.

Computer source

- **HDMI** *(input 2)*
  Receives digital signal from HDMI-compliant devices. The audio from the HDMI source is available on the SPDIF output.
- **DVI** *(input 3)*
  This input has a DVI-I connector, which can receive either analog (DVI-A) or digital (DVI-D) signal from a compatible source.
- **VGA** *(input 1)*
  Receives analog signal from a computer. When using this input, it is best to use a fully wired VGA cable to connect the source to the projector. This will allow the source to determine the projector's capabilities via DDC and show an optimized image. Such cables can be identified as they have a blue connector shell.

Video source

- **3G-SDI** *(input 4)*
  Uses a BNC connector to receive uncompressed, unencrypted digital video.
- **Component** *(input 7)*
  RGsB or RGBS, or YPbPr
- **S-Video** *(input 6)*
  Uses a 4-pin mini-DIN connector.
- **Composite 1** *(input 5)*
  Uses a BNC connector to receive composite video.
- **Composite 2** *(input 8)*
  Uses an RCA phono connector to receive composite video.

Notes

For information on how to configure the DVI input for your source, see ***Signal Inputs And Outputs*** *in the* ***Connection Guide****.*

EDID on the DVI and VGA inputs

If you are using a computer DVI card or another source that obeys the EDID protocol, the source will automatically configure itself to suit the projector.

Otherwise refer to the documentation supplied with the source to manually set the resolution to the DMD™ resolution of the projector or the nearest suitable setting. Switch off the source, connect to the projector, then switch the source back on again.

Using HDMI/DVI switchers with the projector

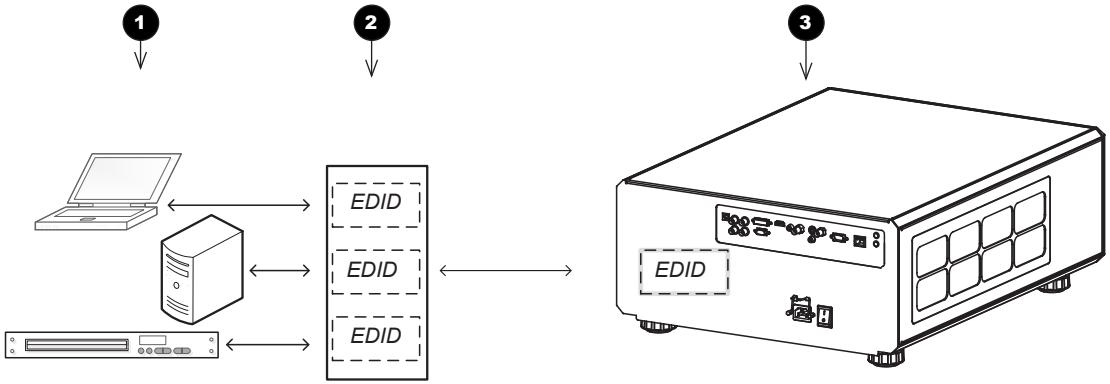
When using an HDMI/DVI source switcher with the projector, it is important to set the switcher so that it passes the projector EDID through to the source devices. If this is not done, the projector may not be able to lock to the source or display the source correctly as its video output timings may not be compatible with those of the projector. Sometimes this is called transparent, pass-through or clone mode. See your switcher's manual for information on how to set this mode.

Additionally, sources which use HDCP encryption may not display properly when connected to the projector via a switcher. Refer to the switcher's manual for more information.

1 **Sources**

2 **Switcher**

3 **Projector**



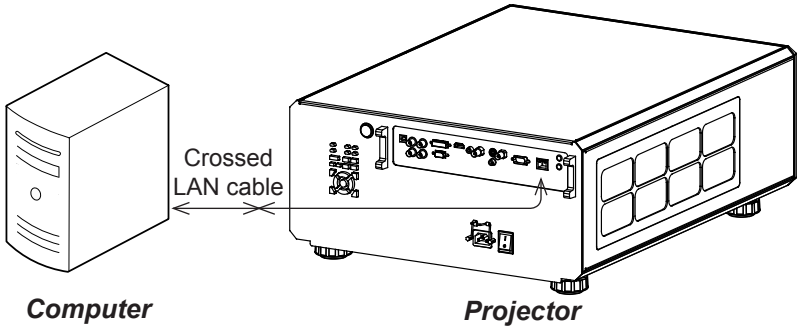
The EDIDs in the switcher should be the same as the one in the projector.

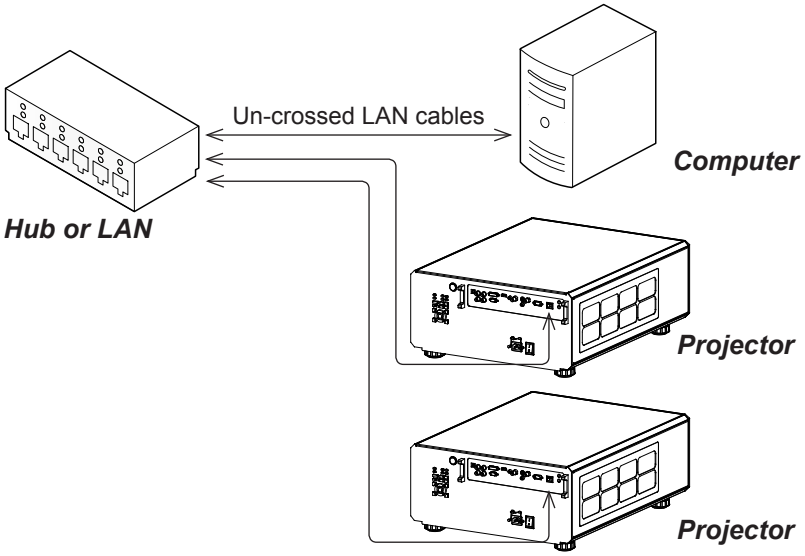
Notes

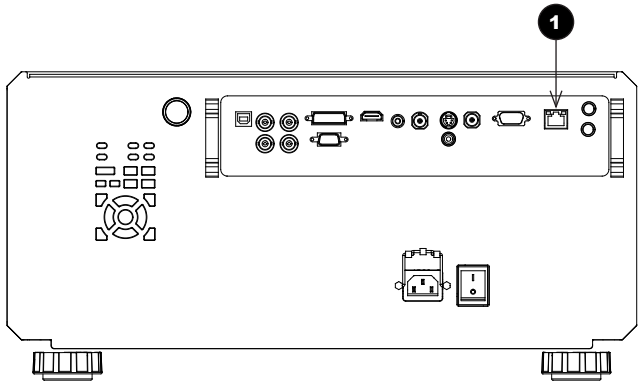
Control Connections

LAN connection

The projector's features can be controlled via a LAN connection, using a standard internet browser package.





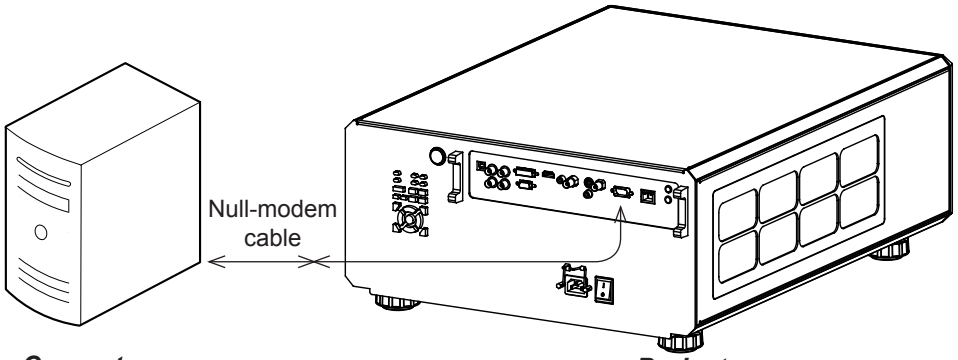


1 **LAN**

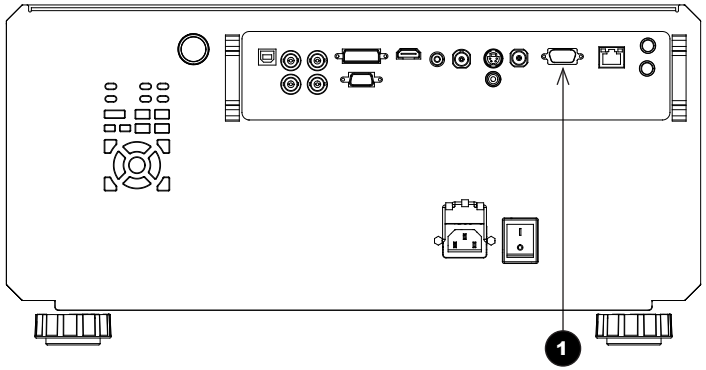
Notes

*For further information on using a network connection to control the projector, see the **Protocol Guide**.*

RS232 connection



1 **RS232**



Back panel with control connections

Notes

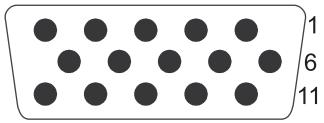
Wiring Details

Signal inputs and outputs

Input 1: VGA

15 way D-type connector

1	R
2	G
3	B
4	unused
5	Digital Ground (H Sync)
6	R Ground
7	B Ground
8	G Ground
9	+5V
10	Digital Ground (V Sync/DDC)
1	unused
12	SDA
13	H Sync
14	V Sync
15	SCL



VGA: pin view of female connector

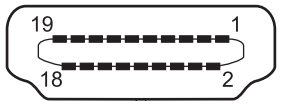
Notes

*For full details of all input settings, see **Input Configuration** in the **Operating Guide**.*

Input 2: HDMI

19 way type A connector

1	TMDS Data 2+
2	TMDS Data 2 Shield
3	TMDS Data 2-
4	TMDS Data 1+
5	TMDS Data 1 Shield
6	TMDS Data 1-
7	TMDS Data 0+
8	TMDS Data 0 Shield
9	TMDS Data 0-
10	TMDS Clock+
11	TMDS Clock Shield
12	TMDS Clock-
13	CEC
14	not connected
15	SCL (DDC Clock)
16	SCA (DDC Data)
17	DDC/CEC Ground
18	+5 V Power
19	Hot Plug Detect



HDMI: pin view of panel connector

Output: SPDIF

RCA Phono

Digital audio output from the HDMI input stream.

SPDIF connector

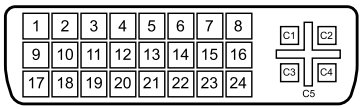
Notes

*For full details of all input settings, see **Input Configuration** in the **Operating Guide**.*

Input 3: DVI

24 way D-type connector

Pin 1	TMDS data 2−	Digital red− (link 1)
Pin 2	TMDS data 2+	Digital red+ (link 1)
Pin 3	TMDS data 2/4 shield	
Pin 4	TMDS data 4−	Digital green− (link 2)
Pin 5	TMDS data 4+	Digital green+ (link 2)
Pin 6	DDC clock	
Pin 7	DDC data	
Pin 8	Analog vertical sync	
Pin 9	TMDS data 1−	Digital green− (link 1)
Pin 10	TMDS data 1+	Digital green+ (link 1)
Pin 11	TMDS data 1/3 shield	
Pin 12	TMDS data 3-	Digital blue− (link 2)
Pin 13	TMDS data 3+	Digital blue+ (link 2)
Pin 14	+5 V	Power for monitor when in standby
Pin 15	Ground	Return for pin 14 and analog sync
Pin 16	Hot plug detect	
Pin 17	TMDS data 0−	Digital blue− (link 1) and digital sync
Pin 18	TMDS data 0+	Digital blue+ (link 1) and digital sync
Pin 19	TMDS data 0/5 shield	
Pin 20	TMDS data 5−	Digital red− (link 2)
Pin 21	TMDS data 5+	Digital red+ (link 2)
Pin 22	TMDS clock shield	
Pin 23	TMDS clock+	Digital clock+ (links 1 and 2)
Pin 24	TMDS clock−	Digital clock− (links 1 and 2)
C1	Analog red	
C2	Analog green	
C3	Analog blue	
C4	Analog horizontal sync	
C5	Analog ground	Return for R, G, and B signals



DVI: pin view of female connector

Notes

High-bandwidth Digital Content Protection (HDCP) is supported on this input.

For full details of all input settings, see ***Input Configuration*** *in the* ***Operating Guide****.*

Input 4: 3G-SDI

75 ohm BNC

3G-SDI connector

Input 5: Composite 1

75 ohm BNC

Composite 1 connector

Input 6: S-Video

4 pin mini-DIN

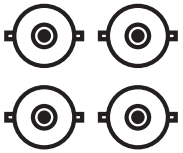
1	Y Ground
2	C Ground
3	Luminance (Y)
4	Chrominance (C)

S-Video: pin view of female connector

Input 7: Component

4 x 75 ohm BNC

	RGsB	RGBS	YPrPb
Pb/B	B	B	Pb/Cb
Y/G	G + Sync	G	Y
Pr/R	R	R	Pr/Cr
SYNC		Sync	



Component

Input 8: CVBS

RCA Phono

CVBS connector

Notes

3G-SDI signals are very high speed digital signals which require better quality coaxial cable than conventional analogue video. The data rate is 3 Gigabits per second.

In choosing cable length and connectors for any installation the frequency response loss in decibels should be proportional to √f, from 1MHz, to 3GHz.

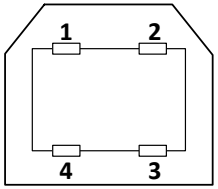
*For full details of all input settings, see **Input Configuration** in the **Operating Guide**.*

Control connections

Service port

USB type B socket

Pin 1	VCC (+5 V)
Pin 2	Data−
Pin 3	Data+
Pin 4	Ground

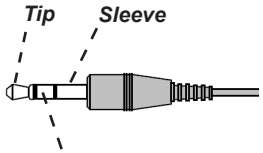


Service port:
pin view of female connector

Wired remote control

3.5mm mini jack

Tip	Power
Ring	Signal
Sleeve	Ground



pin view of female connector

Notes

*For full details of all network settings, see **Network** in the **Operating Guide**.*

Note that plugging in the remote control cable will disable the infra-red.

RS232

9 way D-type connector

1 unused

2 Received Data (RX)

3 Transmitted Data (TX)

4 unused

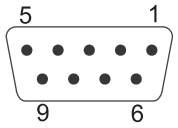
5 Signal Ground

6 unused

7 unused

8 unused

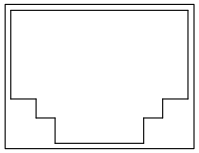
9 unused



RS232:
pin view of female connector

LAN connection

RJ45 socket



LAN connection

Notes

Only one remote connection (RS232 or LAN) should be used at any one time.

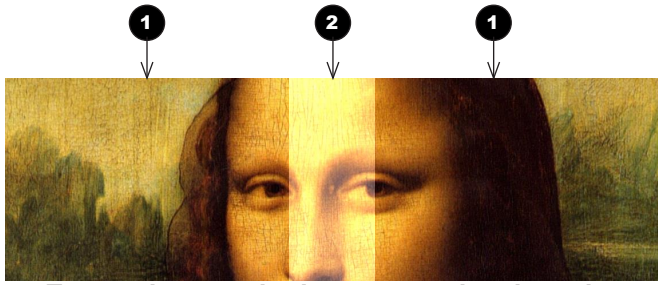
For full details of all input settings, see ***Network*** *in the* ***Operating Guide****.*

Edge Blend And Black Level Uplift

The **Edge Blend** setting is used to improve the appearance of multi-projector displays, by blending overlapping edges to present a seamless image.

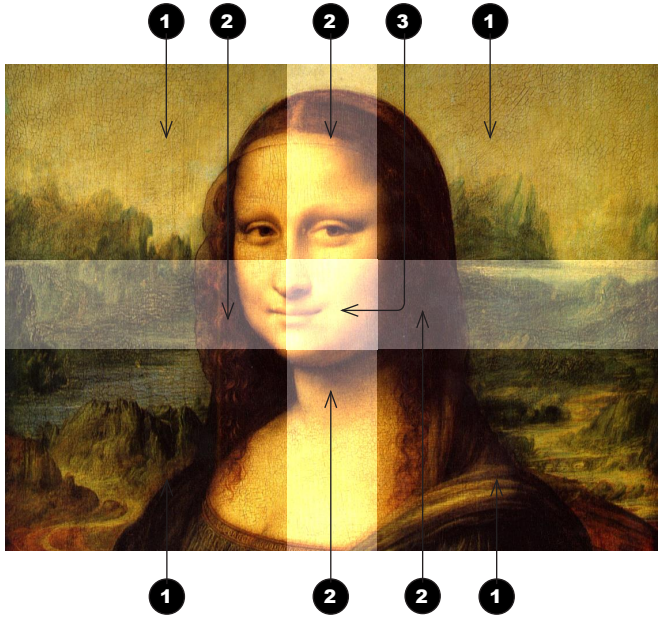
When several projectors are used to create a large tiled image, the overlapping edges may appear brighter than the rest of the image. As it is not possible for any projector to produce an absolute black, any 'black' areas in the overlapped edges may appear slightly less dark than those in the rest of the image. **Black Level Uplift** can be used to counteract this effect, by raising the black level of the rest of the image. The amount of uplift required will be either x2 or x4, depending on how many images are overlapped, as shown in the examples on this page.

Image brightness changes from one point to another, within the same blended region. If the same level of black level uplift is applied throughout the blended region, the overlapping edges may still be visible on the screen. Therefore, brightness in these areas is decreased gradually, using an s-curve factor. **S-Curve Value** is used to control the steepness of the decrease.



Two projectors sharing one overlapping edge

1. x2 uplift area
2. no uplift



Four projectors with overlapping edges

1. x4 uplift area
2. x2 uplift area
3. no uplift

Notes

Appendix A: Lens Part Numbers

Throw ratios	Lens extension (±2%)	Throw distance range	Part number
0.77 : 1 fixed lens	80 mm (3.2 in)	1.3 - 2.5 m (4.3 - 8.2 ft)	110-808
1.16 : 1 fixed lens	54 mm (2.1 in)	1.4 - 6.2 m (4.6 - 20.3 ft)	110-809
1.45 - 1.74 : 1 zoom lens	24 mm (1.0 in)	1.8 - 9.3 m (5.9 - 30.5 ft)	110-803
1.74 - 2.17 : 1 zoom lens	0	2.2 - 11.8 m (7.2 - 38.7 ft)	110-804
2.17 - 2.90 : 1 zoom lens	0	2.7 - 15.4 m (8.9 - 50.5 ft)	110-805
2.90 - 4.34 : 1 zoom lens	0	3.6 - 22.5 m (11.8 - 73.8 ft)	110-806
4.34 - 6.76 : 1 zoom lens	0	5.5 - 35 m (18 - 115 ft)	110-807

Notes

The Throw ratio for a particular lens is fixed, but assumes that the image fills the width of the DMD™.

For images that do not fill the width of the DMD™, the throw ratio is effectively increased. To correct for this in these calculations, a throw ratio correction (TRC) is used.

Throw distance calculations are based on the distance from the outer end of the lens, which will vary from lens to lens.

Lens extension is measured when the lens is focussed at infinity, and fully extended. At other focus settings, the extension could be up to 10mm less.

Appendix B: Supported Signal Input Modes

Standard		Resolution	Vertical Frequency (Hz)	Total number of lines	Horizontal Frequency (kHz)	Composite 1 & 2 / S-Video	Component	DVI (DVI-A) / VGA	DVI (DVI-D) / HDMI	3GSDI
SDTV	480i	720 x 480	59.94	525	15.73	✓	✓			✓
	576i	720 x 576	50.00	625	15.63	✓	✓			✓
EDTV	480p59	720 x 480	59.94	525	31.47		✓		✓	✓
	480p60	720 x 480	60.00	525	31.50		✓		✓	✓
	576p50	720 x 576	50.00	625	31.25		✓		✓	✓
HDTV	720p50	1280 x 720	50.00	750	37.50		✓		✓	✓
	720p59	1280 x 720	59.94	750	44.96		✓		✓	✓
	720p60	1280 x 720	60.00	750	45.00		✓		✓	✓
	1080s23	1920 x 1080	23.98	1125	26.97		✓		✓	✓
	1080p23	1920 x 1080	23.98	1125	26.97		✓		✓	✓
	1080s24	1920 x 1080	24.00	1125	27.00		✓		✓	✓
	1080p24	1920 x 1080	24.00	1125	27.00		✓		✓	✓
	1080p25	1920 x 1080	25.00	1125	28.13		✓		✓	✓
	1080p29	1920 x 1080	29.97	1125	33.72		✓		✓	✓
	1080p30	1920 x 1080	30.00	1125	33.75		✓		✓	✓
	1080i50	1920 x 1080	50.00	1125	28.13		✓		✓	✓
	1080p50	1920 x 1080	50.00	1125	56.25		✓		✓	✓
	1080i59	1920 x 1080	59.94	1125	33.72		✓		✓	✓
	1080p59	1920 x 1080	59.94	1125	67.43		✓		✓	✓
	1080i60	1920 x 1080	60.00	1125	33.75		✓		✓	✓
	1080p60	1920 x 1080	60.00	1125	67.50		✓		✓	✓

Notes

Standard		Resolution	Vertical Frequency (Hz)	Total number of lines	Horizontal Frequency (kHz)	Composite 1 & 2 / S-Video	Component	DVI (DVI-A) / VGA	DVI (DVI-D) / HDMI	3GSDI
COMPUTER	VGA59	640 x 480	59.94	525	31.47			✓	✓	
	VGA60	640 x 480	60.00	525	31.50			✓	✓	
	MACI	640 x 480	66.67	525	35.00			✓	✓	
	VGA72	640 x 480	72.81	520	37.86			✓	✓	
	VGA75	640 x 480	75.00	500	37.50			✓	✓	
	DOS70	720 x 400	70.09	449	31.47			✓	✓	
	SVGA50	800 x 600	49.92	621	31.00			✓	✓	
	SVGA56	800 x 600	56.25	625	35.16			✓	✓	
	SVGA60	800 x 600	60.32	628	37.88			✓	✓	
	SVGA72	800 x 600	72.19	666	48.08			✓	✓	
	SVGA75	800 x 600	75.00	625	46.88			✓	✓	
	MACII	832 x 624	75.08	1120	49.10			✓	✓	
	XGA50	1024 x 768	49.98	793	39.63			✓	✓	
	XGA60	1024 x 768	60.00	806	48.36			✓	✓	
	XGA70	1024 x 768	70.07	806	56.48			✓	✓	
	XGA75	1024 x 768	75.03	800	60.02			✓	✓	
	XGA+70	1152 x 864	70.01	912	63.85				✓	
	XGA+75	1152 x 864	75.00	900	67.50				✓	
	MAC2	1152 x 870	75.06	915	68.68			✓	✓	
	SUN1166	1152 x 900	66.00	937	61.85			✓	✓	
	WXGA50	1280 x 720	49.83	744	37.07				✓	
	WXGA60	1280 x 720	59.86	748	44.77				✓	
	WXGA50	1280 x 768	49.92	793	39.59				✓	
	WXGA60	1280 x 768	59.87	798	47.78				✓	
	SXGA-60	1280 x 960	60.00	1000	60.00				✓	

Notes

Standard		Resolution	Vertical Frequency (Hz)	Total number of lines	Horizontal Frequency (kHz)	Composite 1 & 2 / S-Video	Component	DVI (DVI-A) / VGA	DVI (DVI-D) / HDMI	3GSDI
COMPUTER (continued)	SXGA50	1280 x 1024	49.84	1057	52.68			✓	✓	
	SXGA60	1280 x 1024	60.02	1066	63.98			✓	✓	
	SXGA75	1280 x 1024	75.02	1066	79.98			✓	✓	
	HD50	1360 x 768	49.89	793	39.56				✓	
	HD60	1360 x 768	59.80	798	44.72				✓	
	SXGA+50	1400 x 1050	49.97	1083	54.12			✓	✓	
	SXGA+60	1400 x 1050	59.98	1089	65.32			✓	✓	
	WSXGA50	1536 x 960	49.93	991	49.48				✓	
	WSXGA60	1536 x 960	59.91	996	59.67				✓	
	UXGA50	1600 x 1200	49.92	1238	61.78			✓	✓	
	UXGA60	1600 x 1200	60.00	1250	75.00			✓	✓	
	WSXGA+60	1680 x 1050	59.95	1089	65.29				✓	
	FHD50	1920 x 1080	49.92	1114	55.62			✓	✓	
	FHD60	1920 x 1080	59.93	1125	66.59			✓	✓	
	WUXGA50	1920 x 1200	49.93	1238	61.81			✓	✓	
	WUXGA60	1920 x 1200	59.95	1235	74.04			✓	✓	

Notes

Appendix C: Glossary Of Terms

Notes

1080p

An ***HDTV resolution*** which corresponds to 1920 x 1080 pixels (a widescreen ***aspect ratio*** of 16:9).

Anamorphic lens

A special lens which, when used with the ***TheaterScope aspect ratio***, allows watching 2.35:1 content packed in a 16:9 source.

Aspect ratio

The proportional relationship between the width and the height of the projected image. It is represented by two numbers separated by a colon, indicating the ratio of image width and height respectively: for example, 16:9 or 2.35:1.

Not to be confused with ***resolution***.

Blanking (projection)

The ability to intentionally turn off, that is, set to black, areas around the edges of the projected image. It is sometimes referred to as “curtains” since it can be used to blank an area of image that literally falls on the curtains at the side of the screen in a movie theater. Usually no image resizing or geometric correction takes place and the “blanked” part of the image is lost.

Not to be confused with horizontal and vertical ***blanking (video signal)***.

Blanking (video signal)

The section of the video signal where there is no active video data.

Not to be confused with ***blanking (projection)***.

Brightness (electronic control)

A control which adds a fixed intensity value to every pixel in the display, moving the entire range of displayed intensities up or down, and is used to set the black point in the image (see ***Contrast***). In ***S-Video*** and ***Component Video*** signals, brightness is the same as ***luminance***.

Brightness (optical)

Describes how 'bright' an image that is projected onto a screen appears to an observer.

C

See ***Chrominance***.

Chrominance

Also known as '***C***', this is the component, or pair of components, of an ***S-Video*** or ***Component Video*** signal which describes ***color difference*** information.

Cold mirror

A mirror that preferentially reflects or transmits infra-red light. In a projector, a cold mirror is used to reflect the visible component of the lamp beam into the illumination optics and transmit the unwanted infrared radiation into an absorber.

Color difference

In ***S-Video*** or ***Component Video*** signals, the difference between specified colors and the ***luminance*** component. Color difference is zero for monochrome images.

Color gamut

The spectrum of color available to be displayed.

Color temperature

The position along the black body curve on the chromaticity diagram, normally quoted in Kelvin. It takes into account the preset values for color balance in the service set-up to take up the variations in the prism. The projector allows you to adjust this temperature (i.e. adjust the picture color temperature).

Notes

ColorMax

A method of accurately color-matching projectors together.

Component video

A three or four wire video interface that carries the signal split into its basic ***RGB*** components or ***luminance (brightness)*** and two-***color-difference*** signals (***YUV***) and ***synchronization*** signals.

Composite video

A signal line that carries ***luminance***, ***chrominance***, ***synchronization*** pulses and ***blanking***.

Contrast (electronic control)

The adjustment of the white point of the image without affecting the black point. This increases the intensity range of the displayed image.

Contrast (optical)

The intensity difference between the darkest and lightest areas of the screen.

Cr, Cb

Color difference signals used with '***Y'*** for digital ***Component Video*** inputs. They provide information about the signal color. Not to be confused with ***Pr, Pb***.

Crop

Remove part of the projected image.

Alternatively, fit an image into a frame with a different ***aspect ratio*** by removing part of the image. The image is resized so that either its length or its width equals the length or width of the frame, while the other dimension has moved outside the frame; the excess area is then cut out.

DDC (Display Data Channel)

A communications link between the source and projector. DDC is used on the HDMI, DVI and VGA inputs. The link is used by the source to read the ***EDID*** stored in the projector.

Notes

Deinterlacing

The process of converting ***interlaced*** video signals into ***progressive*** ones.

DHCP (Dynamic Host Configuration Protocol)

A network protocol that is used to configure network devices so that they can communicate on an IP network, for example by allocating an IP address.

DMD™ (Digital Micromirror Device™)

The optical tool that transforms the electronic signal from the input source into an optical image projected on the screen. The DMD™ of a projector has a fixed ***resolution***, which affects the ***aspect ratio*** of the projected image.

A Digital Micromirror Device™ (DMD™) consists of moving microscopic mirrors. Each mirror, which acts as a pixel, is suspended between two posts by a thin torsion hinge. It can be tilted to produce either a bright or dark pixel.

EDID (Extended Display Identification Data)

Information stored in the projector that can be read by the source.

EDID is used on the HDMI, DVI and VGA inputs, allowing the source to automatically configure to the optimum display settings.

EDTV (Enhanced Definition Television)

A ***progressive*** digital television system with a lower resolution than ***HDTV***.

Gamma

A nonlinear operation used to code and decode ***luminance***. It originates from the Cathode Ray Tube technology used in legacy television sets.

Global setting

A projector setting that affects all inputs. In the ***OSD***, global settings are indicated with a globe icon.

HDCP (High-bandwidth Digital Content Protection)

An encryption scheme used to protect video content.

Notes

HDTV (High Definition Television)

A television system with a higher ***resolution*** than ***SDTV*** and ***EDTV***. It can be transmitted in various formats, notably ***1080p*** and 720p.

Hertz (Hz)

Cycles per second.

Horizontal Scan Rate

The rate at which the lines of the incoming signal are refreshed. The rate is set by the horizontal ***synchronization*** from the source and measured in ***Hertz***.

Hs + Vs

Horizontal and vertical ***synchronization***.

Hue

The graduation (red/green balance) of color (applicable to ***NTSC***).

Interlacing

A method of updating the image. The screen is divided in two fields, one containing every odd horizontal line, the other one containing the even lines. The fields are then alternately updated. In analog TV interlacing was commonly used as a way of doubling the refresh rate without consuming extra bandwidth.

IRE

A unit used to show the range from black to white in ***Composite Video*** signals.

LED (Light Emitting Diode)

An electronic component that emits light.

Notes

Letterboxing

Black margins at the top and bottom of the image. Letterboxing appears when a wider image is packed into a narrower frame without changing the original ***aspect ratio***.

Lumen

A photometric unit of radiant power. For projectors, it is normally used to specify the total amount of emitted visible light.

Luminance

Also known as '***Y***', this is the part of an ***S-Video*** or ***Component Video*** signal which affects the brightness, i.e. the black and white part.

Modal setting

A projector setting that only affects the currently displayed input.

Noise

Electrical interference displayed on the screen.

NTSC (National Television Standards Committee)

The United States standard for television - 525 lines transmitted at 60 ***interlaced*** fields per second.

OSD (on-screen display)

The projector menus allowing you to adjust various ***global*** and ***modal settings***.

PAL (Phase Alternate Line)

The television system used in the UK, Australia and other countries - 625 lines transmitted at 50 ***interlaced*** fields per second.

Pillarboxing

Black margins at the left and right of the image. Pillarboxing appears when a narrower image is packed into a wider frame without changing the ***aspect ratio***.

Notes

Pr, Pb

Color difference signals used with '*Y'* for analog *Component Video* inputs. They provide information about the signal color. Not to be confused with *Cr, Cb*.

Progressive scanning

A method of updating the image in which the lines of each frame are drawn in a sequence, without *interlacing*.

Resolution

The number of pixels in an image, usually represented by the number of pixels per line and the number of lines (for example, 1920 x 1200).

RGB (Red, Green and Blue)

An uncompressed *Component Video* standard.

S-Video

A video signal which has separate *Y* and *C* signals.

Saturation

The amount of color in an image.

Scope

An *aspect ratio* of 2.35:1.

SDTV (Standard Definition Television)

An *interlaced* television system with a lower *resolution* than *HDTV*. For *PAL* and *SECAM* signals, the resolution is 576i; for *NTSC* it is 480i.

SECAM (Sequential Color with Memory)

The television system used in France, Russia and some other countries - 625 lines transmitted at 50 *interlaced* fields per second.

Notes

SPDIF

Sony/Philips Digital Interface. A digital audio interface standard.

Synchronization

A timing signal used to coordinate an action.

TheaterScope

An ***aspect ratio*** used in conjunction with a special ***anamorphic lens*** to display 2.35:1 images packed into a 16:9 frame.

Throw distance

The distance between the screen and the projector.

Throw ratio

The ratio of the ***throw distance*** to the screen width.

TRC (Throw ratio correction)

A special number used in calculating ***throw distances*** and ***throw ratios*** when the image does not fill the width of the ***DMD™***.

TRC is the ratio of the DMD™ aspect ratio to the image source aspect ratio:

$$TRC = \frac{DMD™\ aspect\ ratio}{Source\ aspect\ ratio}$$

TRC is only used in calculations if it is greater than 1.

UXGA

A display ***resolution*** of 1600x1200 pixels with a 4:3 screen ***aspect ratio***. (Stands for *Ultra Extended Graphics Array*.)

Notes

Vertical Scan Rate

The rate at which the frames of the incoming signal are refreshed. The rate is set by the vertical ***synchronization*** from the source and measured in ***Hertz***.

Vignetting

Optical cropping of the image caused by the components in the projection lens. This can happen if too much offset is applied when positioning the image using the lens mount.

Vista

An ***aspect ratio*** of 1.66:1.

Warp

A set of projector functions that allow you to intentionally distort the image, for example to fit an arbitrarily shaped screen.

WUXGA

A display ***resolution*** of 1920 x 1200 pixels with a 16:10 screen ***aspect ratio***. (Stands for Widescreen *Ultra Extended Graphics Array*.)

Y

This is the ***luminance*** input (***brightness***) from an ***S-Video*** or ***Component Video*** signal.

YUV

See ***Pr, Pb***.

Notes